The "Price" of Price-only Contracts in Competitive Supply Chains when Pricing is Endogenous
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Abstract:

In this work, we investigate a two-tier supply chain in which there is a supplier (leader) using price-only contracts and several retailers (followers) competing through selling substitutable or complementary products. Our goal in this work is to determine how i) vertical and horizontal competition as well as ii) endogenous pricing decisions, affect the supply chain in a market of differentiated products. In particular, our goal is to determine how prices, order quantities and chain-wide profits get affected due to lack of coordination. There is a huge literature in Operations Management on contracts that coordinate two tier-supply chains. In many papers either pricing is exogenous, and/or there is a single supplier and a single retailer, and even when there are multiple retailers the products are assumed to be substitutable and the retailers symmetric. This work aims to answer these questions relaxing these assumptions.

In particular, this research considers several asymmetric retailers who compete either through deciding how to price in the market (price competition) or by deciding how to order from the supplier (quantity competition). In price competition, the demand of each retailer is a function of the prices and in fact, depends on all the retailers' prices. Analogously, in quantity competition, the price each retailer can charge for its products depends on the sales volumes targeted by all retailers.

To determine how chain-wide profits as well as prices and order quantities are affected due to horizontal and vertical competition, we derive tight lower and upper bounds on prices, order quantities and chain-wide profits. We conclude that for substitutable products (in either price or quantity competition), the loss of profit due to lack of coordination in the supply chain is no more than 25%. Furthermore, we illustrate that in many real life scenarios, this loss is much smaller (e.g., 15% or less). This implies that in a substitutable product market, there may be little room for improvement from more elaborate contracts, which are often costly to implement.

On the other hand, we find that for complementary products, the decentralized supply chain is less efficient. In fact it loses at least 25% of the total profit compared to the centralized setting. This result suggests that large efficiency gains can be achieved through more complex contracts that coordinate the chain.

Biographical Sketch:

Georgia Perakis is the William F. Pounds Professor at the Sloan School of Management at MIT. She joined the faculty at Sloan in 1998. She received an M.S. degree and a PhD in Applied Mathematics from Brown University. In the Spring of 2006 she visited for her sabbatical Columbia University.
Georgia Perakis' research interests include applications of optimization and equilibrium in revenue management, pricing, supply chain management and transportation. She has widely published in journals such as Operations Research, Management Science, Mathematics of Operations Research and Mathematical Programming among others. She has received the CAREER award from the National Science Foundation and subsequently the PECASE award from the office of the President on Science and Technology. She has also received an honorable mention in the TSL Best Paper Award, the Graduate Student Council Teaching Award for excellence in teaching, the Sloan Career Development Chair and subsequently the J. Spencer Standish Career Development Chair. Recently Perakis received the William F. Pounds chair. Perakis has passion supervising her students and builds lifelong relationships with them. So far she has graduated 9 PhD and 13 Masters students.

Perakis serves as an Associate Editor for the journals Management Science, Operations Research, and Naval Logistics Research. She is a senior Editor for POMm an Area Editor in the area of Supply Chain Management and Services for the journal Networks and Spatial Economics and America's editor for the journal of Pricing and Revenue Management. Perakis has served as a member of the INFORMS Council and served as the chair of the Pricing and Revenue Management Section of INFORMS for two years. She is currently the VP for Meetings of the MSOM Society of INFORMS. She has co-organized the MSOM 2009 conference and is in the organizing committee of the 2010 MSOM conference. She has also been the co-chair and co-organizer of the Annual Conference of the INFORMS Section on Pricing and Revenue Management for several years and the chair of the cluster on the same topics for the annual INFORMS conference for several years.