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Research and Management Insights

Preventing and Diagnosing Colorectal Cancer with a Limited Colonoscopy Resource

Evrim Didem Güneş, E. Lerzan Örmeci, Derya Kunduzcu

Colonoscopy is the preferred test for colorectal cancer screening because it can prevent future cancers, while resources for this expensive test are limited in many countries. Colonoscopy is used for both screening asymptomatic individuals, and confirming diagnosis for symptomatic individuals before treatment can begin. Hence, these two types of patients have to compete for the limited resources. In the face of increasing demand for cancer screening, there is an imperative to explore best resource-allocation policies and understand the impact of capacity limitations on health outcomes. Güneş, Örmeci and Kunduzcu build a compartmental model and run numerical experiments to explore this issue. This study shows that cancer mortality and incidence rates are affected significantly from resource allocation policies. To minimize mortality, sufficient capacity should be allocated to diagnosis to ensure that the wait for diagnosis is at reasonable levels, and the remaining capacity should be allocated to screening. When the relevant performance measure is the incidence rate, screening should be allocated more capacity compared to the case with mortality rate measure. Numerical results also show that benefits from increasing compliance to screening programs can only be realized if there is sufficient service capacity.

The Timing of Capacity Investment with Lead Times: When Do Firms Act in Unison?

Edward James Anderson and Shu-Jung Sunny Yang

One of the most important strategic decisions facing a firm is the timing of capacity investment. One element in this decision is whether to invest prospectively, in advance of customer demand, or whether to wait till demand has outpaced existing capacity before making the investment. Any decision needs to pay attention to the other firms in the market place: should a firm invest at the same time as rival firms to protect its competitive position, or at a different time to avoid overcapacity? Anderson and Yang develop an endogenous timing game to derive managerial insights about the joint impact of lead time and other operational factors including volume flexibility and existing capacity on competitive capacity investment timing. The analysis in the paper helps to explain the empirical evidence that firms often have poorly timed capacity investment decisions. The authors show that, if firms are going to invest, then they are most likely to act in unison, leading to a type of bandwagon behavior. Specifically, when there is no volume flexibility in production and capacity-building lead times are short, it is rare to see investment behavior in which one firm takes the lead and the other firm waits to see how demand works out. Managers need to consider the individual characteristics of their industry such as lead time and volume flexibility in order to understand the competitive capacity investment timing decision.

Production and Sales Planning in Capacitated New Product Introductions

Ozlem Bilginer, Feryal Erhun

How should a firm with limited capacity introduce a new product? Should it introduce the product as soon as possible or delay introduction to build up inventory? How do the product and market characteristics affect the firm's decisions? Combining marketing and operations management decisions in a stylized model, Bilginer and Erhun analyze new product introductions under capacity restrictions using a two-period model with diffusion-type demand to answer such questions. The authors show that an intentional backlogging of demand that serves to decrease the demand in the second period and hence to reduce the total backlog cost may indeed be optimal. That is, the firm may (partially) delay the introduction of its product and incur short-term backlog costs to manage its future demand and total costs more effectively. The authors also study the optimal capacity decision of the firm and show that capacity shortages may be intentional.

Managing Perishables with Time and Temperature History

Michael Ketzenberg, Jacqueline Bloemhof, and Gary Gaukler

Ketzenberg, Bloemhof and Gaukler investigate an inventory control problem that presents itself in supply chains for perishable, temperature-sensitive food products. Inventory managers have to contend with the issue of food spoilage as a result of both temperature exposure and flow time of the food product from producer to retailer. RFID and sensor technologies present an opportunity to make better inventory control decisions based on precise knowledge of the time and temperature history of a given shipment. In this paper, the authors quantify the value of such time and temperature history information to a supply chain. Using examples of fresh fish, they find that correctly using the time and temperature history information leads to average cost savings of 43.2%, with savings as high as 73.7%. The highest cost savings arise from decreasing spoilage and simultaneously increasing product availability and thereby service levels.

A Comparison of Product Take-Back Compliance Schemes

Gökçe Esenduran and Eda Kemahlıoğlu-Ziya

Motivated by the firms' concern about minimizing compliance cost under product take-back regulation, Gökçe Esenduran and Eda Kemahlıoğlu-Ziya consider two of the most commonly used compliance schemes, i.e., individual compliance and collective compliance with cost allocation by market share, and compare them with respect to the costs they impose on firms and the environmental benefits. They show that the composition of a collective scheme plays an important role on the firm's decision. If the collective scheme consists of many small firms, even if the total market share of the scheme is large, a relatively big firm in this scheme incurs higher cost than it would under the individual scheme. As for environmental benefits, collective schemes are generally believed to achieve higher collection rates but provide lower incentives for designing greener products. Authors show that these intuitions may not always hold: First, when the potential savings in recycling cost from design changes that make the product more recyclable are high and there are relatively small firms in a large collective scheme, a higher collection rate can be achieved under individual compliance. Second, collective schemes including firms with large market shares may provide superior incentives for increasing recyclability than individual compliance does.

Supplier Encroachment as an Enhancement or a Hindrance to Nonlinear Pricing

Zhuoxin Li, Stephen M. Gilbert, and Guoming Lai

Many firms sell their products not only through resellers, but also through their own direct channels, a practice known as supplier encroachment. Previous research on supplier encroachment has focused nearly exclusively on linear wholesale pricing. For linear wholesale prices it has been established that supplier encroachment can mitigate the effects of double marginalization, and that there exists a range of supplier inefficiency for which encroachment benefits not only the supplier, but also the reseller. However, because there are many examples of non-linear pricing in practice, Zhuoxin Li, Stephen Gilbert, and Guoming Lai focus on the implications of supplier encroachment when the supplier can implement a non-linear pricing policy. If both the supplier and the reseller have access to the same information about demand, then the supplier can coordinate the channel and extract all of the rents with a non-linear pricing policy alone, and there is no potential for benefit from encroachment. Yet, in practice, resellers often possess better information about demand than does a supplier, even when the supplier has her own direct channel. This paper demonstrates that, when the reseller has an informational advantage, there are two potential effects from the supplier developing a direct channel. The first effect is that the option of selling directly can allow the supplier to reduce information rents received by the reseller without sacrificing as much efficiency as she would have to without it. However, the second effect is that the direct channel gives the supplier the ability to behave opportunistically, by selling more through the direct channel than the reseller would prefer. This unavoidable incentive for the supplier to behave opportunistically after transacting with the reseller can interfere with the efficiency of the quantity exchanged between them. Depending upon which of these two effects dominates, a supplier's development of encroachment capability can either benefit or harm both the supplier and the reseller.

A Newsvendor Who Chooses Informational Effort

Thomas Marschak, J. George Shanthikumar, Junjie Zhou

Improved information about demand and/or supply improves the performance of a properly optimized

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supply chain even though the improved information has a cost. When alternative information sources are available and one has to choose one of them, it is important to know which of these sources will result in a best performance by the supply chain. Thomas Marschak, George Shanthikumar, and Junjie Zhou develop a criterion for choosing the information source that results in the best performance by a properly optimized supply chain. They also provide the effect of improved information on the optimal supply quantity. That will allow the supplier to prepare increased supply capacity or to make an increased commitment to other manufacturers.

The Impact of Contracts and Competition on Upstream Innovation in a Supply Chain

Jingqi Wang, Hyoduk Shin

Companies may procure components of their products from suppliers who can increase the quality of the components through innovation investment. High-quality components lead to high-quality end products and thus higher consumers' willingness to pay. Jingqi Wang and Hyoduk Shin examine the impact of various contracts on the supplier's innovation investment, and demonstrate that when the innovation is costly, a commonly-used wholesale price contract between the supplier and the manufacturer can result in under-investment in innovation, which in turn leads to supply chain inefficiency. One way to regain supply chain efficiency is to employ a revenue-sharing contract instead of a simple wholesale price contract. Although the revenue-sharing contract is an optimal contract for the whole supply chain, solving the supplier's under-investment in innovation issue, it is not the best for the manufacturer. Instead, the manufacturer can be better off by employing a wholesale price contract and specifying the quality requirement of the component, specifically when innovation investment is not very costly. The authors also show that inviting supplier competition can significantly increase the manufacturer's profit.

An Analysis of Scoring and Buyer-Determined Procurement Auctions

Natalia Santamaría

A popular practice in dynamic procurement auctions is to have suppliers compete on price, and adjust their price bids to reflect non-price attributes after bidding is over. In this buyer-determined setting, a supplier can lose the auction and be awarded the contract. This situation can lead to non-competitive prices for the buyer. An alternative is to have suppliers compete on adjusted bids (price bids plus non-price attributes) and award the contract to the winner of this scoring auction. However, in this setting the buyer needs to determine the non-price attributes for all suppliers, whereas in the buyer-determined auction he can adjust a subset of the bids. Using a *rank based buyer-determined auction with rank k*, where the buyer adjusts only the k lowest bids, Natalia Santamaría compares the average cost for the buyer from both formats. Results suggest that the scoring auction generally yields a lower average cost for the buyer than the buyer-determined auction, but the difference is not significant when $k = 1$ in the latter. Therefore, if the buyer has the non-price attributes at hand he could run a scoring auction, but if they are expensive or difficult to calculate, he can run a buyer-determined auction and set $k = 1$.

Contractors' and Agency Decisions and Policy Implications in A+B Bidding

Diwakar Gupta, Eli M. Snir, Yibin Chen

A+B bidding is an innovative contracting mechanism that scores contractors on both cost (A component) and completion time (B component). Diwakar Gupta, Eli Snir, and Yibin Chen argue that line-item bids may not reflect contractor's true costs of associated activities because if a contractor's estimate is smaller (larger) than the engineer's estimate for a line item, then it should offer a low (high) price for that item. The authors also explain the effect of reputation cost, which refers to a private penalty that accrues to tardy contractors from increased cost of posting bonds and reduced prospects of winning future projects. They demonstrate that reputation cost and completion time uncertainty together provide an explanation why contractors predominantly finish earlier than bid in practice. More generally, the presence of reputation cost may cause contractors to exert more effort on expediting than the agency will prefer and/or increase time bids, both of which serve to increase agency's total cost. The authors recommend that agencies set the daily incentive, disincentive, and road user costs to be equal and not cap incentives in order to limit underinvestment in expediting relative to a socially optimal benchmark.