

**OPERATIONS AND LOGISTICS DIVISION AND
CENTRE FOR OPERATIONS EXCELLENCE SEMINARS
Sauder School of Business
January 2015 to August 2015**

Date: Tuesday August 11th, 2015

Speaker: Nagesh Gavirneni, Cornell University

Topic: “Solving the Customer Feedback Jigsaw Puzzle: Leveraging Online Text Reviews using Natural Language Processing”

Time: 1:00 PM - 2:30 PM

Place: Henry Angus 968

Abstract: Capturing the accurate and complete picture of the customer experience is a challenging task and the hotel industry relies on a wide variety of mechanisms (e.g. comment cards, mystery shoppers, and Press Ganey surveys) to achieve this objective. With the recent rise in popularity of social networks and travel portals, the industry has unprecedented access to a large and rapidly growing number of customer reviews on these platforms. However, most of this text data is voluminous and unstructured, and is therefore not amenable to analysis using the existing methods that have been designed for quantitative data. In this paper, we show that using automated software tools that have been specially designed to analyze large volumes of text, the hotel industry can leverage these online reviews to construct a better picture of their customer experience and convert that into actionable managerial insights, ultimately improving their operational effectiveness.

Date: Monday June 15th, 2015

Speaker: Eric Park, OPLOG Division, Sauder School of Business

Topic: ““When will I see a doctor? An empirical study of patient prioritization in emergency department triage systems””

Time: 3.30pm to 5.00pm

Place: Henry Angus HA 969

Abstract: We analyze the patient choice behavior of the emergency department (ED) personnel who decides which patient waiting in the ED will be seen by the next available physician. We study over 270,000 patient choices in five EDs using the Canadian Triage and Acuity Scale (CTAS). We use a discrete choice framework consistent with random utility theory in which the choice maker's valuation of each patient depends on both the patient's medical and operational characteristics including wait time and ED congestion. We find that choice makers give priority to patients who waited longer but only up to a threshold point and they are indifferent between patients who waited beyond the threshold. We also find that the choice makers adhere more to the triage priority classification when the waiting area is more congested but not the service area.

Centre for Transportation Studies Seminar

Date: Tuesday June 9th, 2015

Speaker: Yukihiro Kidokoro, National Graduate Institute for Policy Studies (GRIPS), Tokyo

Topic: "A General Equilibrium Analysis of Airport Pricing, Capacity and Regulation"

Time: 12.30pm to 2.00pm

Place: Henry Angus HA 969

Abstract: Using a general equilibrium model including consumers, airlines, and an airport with non-aero service, we analyze an airport's decisions on its charges, its capacities, and the size of its non-aero service in a consistent manner. An important difference from the existing literature is that we formerly formulate airport's non-aero service so that we can include the determination of the size of airport's non-aero service. First, we characterize the results for social welfare maximization, and investigate the applicability of the self-financing property. Second, we derive the results for profit maximization by a monopolistic airport, and demonstrate that taxes for airport's aero service and for investment in airport capacity recover the results for social welfare maximization. Third, we analyze various regulatory regimes, such as social welfare maximization under single-till and dual-till regulations and profit maximization under dual-till regulation, and clarify the distortions caused by the regulations.

* Joint work with Ming Hsin Lin (Osaka University of Economics) and Anming Zhang (University of British Columbia)

Date: Monday June 8th, 2015

Speaker: Yichuan (Daniel) Ding, OPLOG Division, Sauder School of Business

Topic: "Outpatient-Clinic Capacity Management when Continuity of Care Matters"

Time: 3.30pm to 5.00pm

Place: Henry Angus HA 969

Abstract: We study how to manage capacity when continuity of care (COC) affects a health system's payments, but doctors are paid on a fee-for-service (FFS) basis. We model the following strategy that doctors may use to improve COC: recommend some patients to book a follow-up appointment (FUA) before they leave the clinic at the end of their appointments, which is called the same-day follow-up (SDFU) strategy. We develop a principle-agent model and propose a simple, transparent, and outcome-dependent incentive scheme, which gives a second best solution to the capacity-control problem.

Centre for Transportation Studies

Date: Thursday, April 30th, 2015

Speaker: Donald Shoup, University of California, Los Angeles

Topic: "The High Cost of Free Parking"

Time: Noon to 1.30pm

Place: Henry Angus 967

Abstract: In his book, *The High Cost of Free Parking*, Shoup explains how better parking policies can improve cities, the economy, and the environment. He recommends that cities should charge fair market prices for on-street parking, use the meter revenue to finance added public services in the metered neighborhoods, and remove off-street parking requirements.

Date: Monday, April 13th

Speaker: Lauren Lu, Kenan-Flagler Business School, University of North Carolina

Topic: “Do Mandatory Overtime Laws Improve Quality? Staffing Decisions and Operational Flexibility of Nursing Homes”

Time: 3.30pm - 5.00pm

Place: Henry Angus HA 969

Abstract: During the 2000s, over a dozen U.S. states passed laws that prohibit health care employers from mandating overtime for nurses. Using nursing homes data from 2004 to 2012, we find that these mandatory overtime laws reduce the service quality of nursing homes. This outcome can be explained by two undesirable changes in the staffing hours of registered nurses: decreased hours of permanent nurses and increased hours of contract nurses per resident day. We show that these observations are consistent with the predictions of a stochastic staffing model that incorporates demand uncertainty and operational flexibility. Further, we rule out an alternative hypothesis that the quality deterioration is induced by wage changes in the local markets.

Date: Monday, March 30th

Speaker: Krishnamurthy Iyer, Cornell University

Topic: “Welfare Analysis of Dark Pools”

Time: 3.30pm - 5.00pm

Place: Henry Angus HA 969

Abstract: We investigate the role of a class of alternative market structures known as electronic crossing networks or "dark pools". In contrast to traditional "lit" markets, which are often intermediated by dealers and market-makers and where the liquidity is observable, dark pools operate via direct matching between traders and the liquidity in the dark pool is hidden. Relative to the lit markets, dark pools offer investors the trade-off of reduced transaction costs in exchange for greater uncertainty of trade. We study a market with intrinsic traders and speculators, each endowed with heterogeneous fine-grained information, who endogenously choose between dark and lit venues. We solve for an equilibrium in this setting, and address three main questions: First, we illustrate how this choice between the two venues depends critically on the information available to each trader. Second, we establish that while dark pools attract relatively uninformed traders, they still experience adverse selection. Finally, with a competitive dealer market, we show that the introduction of a dark pool can lead to greater transaction costs in the lit market and can decrease the overall market welfare.

Joint work with Ramesh Johari, Stanford University and Ciamac C. Moallemi, Columbia Business School

Centre for Transportation Studies Seminar

Date: Thursday, April 2nd

Speaker: Wenyi Xia, Sauder School of Business

Topic: "Vertical Differentiation between Airline and High Speed Rail: The Effects on Intermodal Competition and Cooperation"

Time: Noon - 1.30pm

Place: Henry Angus 967

Abstract: Among the few papers that have studied the cooperation and competition between High Speed Rail (HSR) and airlines from an analytical point of view, horizontal differentiation between the two modes is assumed. However, the two modes are more likely to be vertically differentiated. The aim of this paper is to study the vertical differentiation between HSR and airline and the effects on fare prices, traffic volumes and social welfare under both the competition and cooperation scenarios. The analysis is conducted in an asymmetric network with the hub airport runways being potentially capacity constrained. We show that beyond certain travel distances, air travel is preferred in both the connecting link and the non-stop link, while air-rail connecting service is only preferable within a shorter distance. We find that rail speed affects air fare on the same competing routes negatively. Further, even when hub airport capacity is sufficient, HSR-airline competition may lead to a lower social welfare than the case of their cooperation in certain markets.

Supervisor: Anming Zhang

Date: Monday, March 23rd

Speaker: Retsef Levi, MIT Sloan

Topic: "Systematic Approach to Manage Risks of Economically Motivated Food and Drug Adulteration in Supply Chains in China"

Time: 3.30pm - 5.00pm

Place: Henry Angus HA 969

Abstract: It is estimated that 15% of all food products consumed in the US are imported, whereas in some product class like seafood more than 80% is imported. Half of all medical devices used in the US are imported, while 80% of the active pharmaceutical ingredients in medications sold in the US are manufactured elsewhere. The overall number of shipments of FDA-regulated products into the US is growing at a rate of 13-15% percent a year, and is expected to reach over 100 million by year in 2015. China is currently the third largest importing source of food products into the US, the second largest importer of biomedical devices, the eight largest importer of drugs and biologics and the second largest importer of cosmetics. Over the last decade there have been very public incidents of economically motivated food and drug products manufactured in China that adversely affected China, the US and other developed countries. Moreover, the evolving global supply chains centered in China and the unique socio

economic and regulatory environments in the country, have created a growing threat to food and drug safety in the US and other developed countries.

In this talk we will describe a multidisciplinary effort to develop a systematic risk management approach to manage risks related to these evolving threats. The approach attempts to bring together methodologies from Operations Research, supply chain management, bio-medical manufacturing, macroeconomics and regulatory sciences and machine learning to create a range of analytical tools and approaches that could inform risk identification, risk prioritization as well as effective management of scarce interventional capabilities. We will describe some in depth analysis of known adulteration incidents and some general insights that arise, as well as more large scale data-driven models that are being developed.

This is joint work with Amine Anoun, Yasheng Huang, Jim Leung, Anthony Sinskey, Stacy Springs, Shannon Stewart, Tauhid Zaman and Karen Zheng

Centre for Transportation Studies Seminar

Date: Friday, March 20th

Speaker: William (Bill Swan), Chief Economist Boeing Corp. (Retired)

Topic: “Airline Network Evolution ↯- Bringing costs, networks, revenue, competition all together”

Time: Noon - 1.30pm

Place: Henry Angus 967

Abstract: In the airline industry, structure is destiny. Airlines compete with overlapping networks of hub operations because of a few simple structural facts. First, big airplanes are cheaper per seat than small airplanes, but travel demand in most city pairs is so small that connecting traffic is needed to make up half the loads. Second, the cost of the extra up-and-down cycle on a connecting trip is equal to about 1000 miles of flying, both for the airline and the customer, so nonstops are cheaper where they can be used. And third, half the revenue comes from the top quarter of the passengers, so it seldom pays to be the second-choice carrier. These conflicting forces come together creating a system that starts with a few major hubs but grows by adding hubs, keeping airplane sizes nearly constant.

Date: Monday, March 16th

Speaker: Ishai Kones, Technion - Israel Institute of Technology*

Topic: "Minimization load balancing scheduling problems: a unified approach for designing EPTAS's"

Time: 3.30pm - 5.00pm

Place: Henry Angus **HA 969**

Abstract: We consider a common generalization of many variants of the load balancing in parallel machines scheduling problems. These can be used for modelling problems such as processor scheduling and transmitting video streams. In particular, each machine can be activated to one of a subset of types associated with it. Activating a machine to a given type incurs an activation cost and any activation of machines to types must obey a bound on the total activation cost. When a job is scheduled to a machine of a given type, it takes on a processing time vector unique to itself and the type. A machine is next assigned a cost which is a function of its load vector. The objective of our problem is to minimize a multidimensional function, which generalizes the l_p norm and makespan, over the costs of these machines.

This problem (as well as many of its special cases) is strongly NP-hard and so neither an optimal solution nor a fully polynomial time approximation scheme can be given for it (assuming P is not equal to NP). Instead, we provide an efficient polynomial time approximation scheme. This scheme mainly relies on an approximate representation of the problem as a mixed integer linear program (MILP), with a constant number of integer variables, where each possible machine's configuration is assigned a variable. We develop a number of counting and rounding techniques to construct the MILP and transform its solution to a feasible near optimal solution to the original problem.

*Research was conducted during his time as an MSc student at the Technion.

Date: Friday March 13th

Speaker: Nils Rudi, INSEAD

Topic: “In-play Football (Soccer) Prediction”

Time: 10.30am - Noon

Place: Henry Angus **HA 233**

Abstract: For in-play football prediction, we consider a model based on Poisson arrival rates of goals. We prove that for a given pre-game trinomial predictive distribution of the result (i.e., home, tie and away), there exist a unique pair of Poisson arrival rates which correspond to it. This facilitates the base model of in-play prediction with an absolute minimum requirement of data analysis. This result is extended to non-stationary arrival rates and state (score difference) dependent arrival rates. We perform an empirical investigation of the models using a large set of data from multiple leagues, and contrast the results with those of logistic regression.

I will also discuss an extremely detailed data set for football and associated research opportunities.

Date: Monday, March 9th

Speaker: Jiri Chod, Boston College

Topic: “Inventory, Risk Shifting, and Trade Credit”

Time: 3.30pm - 5.00pm

Place: Henry Angus **HA 233**

Abstract: This article has two objectives. First, it shows how debt financing distorts the inventory decision of a newsvendor who orders multiple items that differ in cost, revenue, or demand parameters. Taking advantage of limited liability, a debt-financed newsvendor will favor items with a low salvage value, those with a high profit margin, and those that represent a large proportion of the total inventory investment.

Second, we argue that this distortion is mitigated when financing is provided by the supplier(s) who can observe the actual order quantities before determining the credit terms. “Borrowing goods” rather than “borrowing cash” limits the newsvendor’s ability to deviate from the first-best inventory decision. This benefit of trade credit financing is most significant when sourcing multiple differentiated items from a single supplier, and when bankruptcy risk and, thus, the limited liability effect are considerable.

Date: Monday, March 2nd

Speaker: Joel Goh, Harvard School of Business

Topic: "Data Uncertainty in Markov Chains: Application to Cost-effectiveness Analyses of Medical Innovations"

Time: 3.30pm - 5.00pm

Place: Henry Angus **HA 969**

Abstract: Cost-effectiveness studies of medical innovations often suffer from data inadequacy. When Markov chains are used as a modeling framework for such studies, this data inadequacy can manifest itself as imprecision in the elements of the transition matrix. In this paper, we study how to compute maximal and minimal values for the discounted value of the chain (with respect to a vector of state-wise costs or rewards) as these uncertain transition parameters jointly vary within a given uncertainty set. We show that these problems are computationally tractable if the uncertainty set has a row-wise structure. Conversely, we prove that if the row-wise structure is relaxed slightly, the problems become computationally intractable (NP-hard). We apply our model to assess the cost-effectiveness of fecal immunochemical testing (FIT), a new screening method for colorectal cancer. Our results show that despite the large uncertainty in FIT's performance, it is highly cost-effective relative to the prevailing screening method of colonoscopy.

Date: Monday, February 23rd

Speaker: Vlad Babich, McDonough School of Business, Georgetown University

Topic: "Franchise Contracting: The Effects of The Entrepreneur's Timing Option and Debt Financing"

Time: 3.30pm - 5.00pm

Place: Henry Angus **HA 969**

Abstract: We solve a sequential-moves game that involves three players: the franchisor, the entrepreneur, and the banks. The franchisor chooses the contract terms (a one-time franchise fee and a royalty rate for on-going payments). The entrepreneur dynamically decides when to sign this contract, open a store, and apply for debt financing to cover the initial investment. In response to the entrepreneur's application, banks competitively determine loan rates. We find that the franchisor should use royalty cash flows and not the franchise fee to extract value from the entrepreneur. This is a new explanation of empirical evidence that franchise contracts favor royalties over franchise fees. To account for the possibility of the entrepreneur's bankruptcy and bankruptcy costs, the franchisor should decrease the royalty rate. However, despite a lower rate, the threshold for the entrepreneur to open the store is higher in the model with financing than in the model without financing. This threshold is much higher than it would have been for the integrated system, which in turn is higher than the static break-even-NPV threshold. If a franchisor ignores financing considerations, she will suffer from having to wait longer for the store opening and from a higher bankruptcy probability. We predict that the franchisor is the main beneficiary of the entrepreneur's greater initial wealth and that the franchisor will benefit more if she assumes a greater share of the store's operating costs.

Date: Monday, February 16th

Speaker: Nicos Savva, London Business School

Topic: "Decomposing the Effect of Workload on Patient Outcomes: An Empirical Analysis of a Maternity Unit"*

Time: 3.30pm - 5.00pm

Place: Henry Angus **HA 969**

* with Michael Freeman and Stefan Scholtes

Abstract: Extant literature provides strong evidence that service quality (e.g., patient outcomes) deteriorates at high levels of workload. In this paper, we use a detailed dataset from the delivery unit of a major teaching hospital to better understand how workload impacts quality. We consider two mechanisms: direct impact through deterioration in the quality of task execution and indirect through the choice of care pathway. First, we demonstrate that workload has an effect on the care pathway – discretionary but resource-intensive interventions, such as pain relief, are less likely to be administered at high workloads. Second, we show that workload increases the propensity of some adverse outcomes, such as perineal tears, and reduces others, such as emergency cesarean sections. The effect on perineal tears is predominantly direct, while the effect on cesarean sections is indirect. We also examine post-birth length of stay and find that the direct and indirect effects work in opposite directions; while both effects are individually significant, they cancel each other out on aggregate. Our results provide a better understanding of how workload affects quality in service settings and we demonstrate how they can be used to predict changes in outcomes and costs under different demand and staffing scenarios.

Paper: <http://faculty.london.edu/nsavva/FreemanSavvaScholtes.pdf>

Date: Monday, February 2nd

Speaker: Hamed Mamani, University of Washington

Topic: "Supply Chain Coordination in the Presence of Gray Markets and Strategic Consumers"

Time: 3.30pm - 5.00pm

Place: Henry Angus **HA 969**

Abstract: The practice of diverting genuine products to unauthorized gray markets continues to challenge many companies in various industries and creates intense competition for authorized channels. Recent industry surveys report that the abuse of channel incentives is a primary reason for the growth of gray market activities. Therefore, it is crucial that companies take the potential presence of gray markets into consideration when they design contracts to distribute their products through authorized retailers. This issue has received little attention in the extensive literature on contracting and supply chain coordination. In this paper, we analyze the impacts of gray markets on two classic contracts, wholesale price and quantity discount, in a supply chain with one manufacturer and one retailer when the retailer has the opportunity to sell the product to a domestic gray market. Consumers are forward-looking and anticipate the diversion of the product to the gray market. Our analysis provides interesting and counterintuitive results. First, a classic quantity-discount contract that normally coordinates the supply chain can perform so poorly in the presence of a gray market that the supply chain would be better off using a wholesale price contract instead. Second, the presence of a gray market can also degrade the performance of the wholesale price contract; therefore, a more sophisticated contract is needed for coordinating the supply chain in the presence of the gray market. We show that contracts that solely depend on retailer's order quantity cannot coordinate the supply chain, and provide the conditions for coordinating the supply chain with price-dependent quantity discount contracts. We also provide comparative statics and show that when there is a gray market, coordinating the supply chain also enhances total consumer welfare.

Centre for Transportation Studies Seminar

Date: Friday, January 30th

Speaker: Ming Hsin Lin, Osaka University of Economics

Topic: "Hub airport congestion pricing: Discriminatory passenger charges"*

Time: Noon to 1.30pm

Place: Henry Angus HA 968

Abstract: This paper investigates airport pricing in a congested hub-spoke network, which is in contrast to the existing literature that has focused on a single airport. The hub airport levies a per-flight charge on its carriers and discriminatory per-passenger charges on the local and connecting passengers. We characterize the socially optimal airport charges, and provide explanations for why some hub airports charge a connecting passenger lower than a local passenger, even though the connecting passenger contributes a relatively higher runway congestion at the hub. Our main results are: 1) congestion tolls are not needed if the (negative) congestion delay effect is more or less offset by the (positive) schedule delay effect, independent of airline market structure; 2) the optimal charges should levy double delay costs on the connecting passengers, which may lead to a higher per-connecting passenger charge than a per-local passenger charge; 3) generally, the optimal outcome cannot be achieved when the hub airport only levies (aircraft-based) per-flight charges on carriers; 4) the optimal per-connecting passenger charge should be lower (higher, respectively) than the per-local passenger charge when the per-flight charge is large (small, respectively); and 5) the profit-maximizing hub airport can charge a connecting passenger lower than a local passenger.

* Joint work with Anming Zhang, Sauder School of Business, UBC

Date: Monday, January 26th

Speaker: Yuri Levin, Queens University

Topic: "Quantity Competition in the Presence of Strategic Consumers"

Time: 3.30pm - 5.00pm

Place: Henry Angus HA 969

Abstract: Oligopolistic retailers decide on the initial inventories of an undifferentiated limited-lifetime product offered to strategic consumers. A manufacturer sets the first-period (full) price, while the second-period (clearance) price is determined by a market clearing process. Resulting symmetric pure-strategy equilibria may lead to no sales in the first or second period (Cournot outcome versus collusion), and sales in both periods with the clearance price above or at the salvage value. The equilibria possess a comprehensive set of monotonic properties. In particular, increasing strategic behavior can benefit retailers and hurt consumers, increasing competition may harm the local economy, and high levels of strategic behavior may insure against oversupply that leads to clearance sales at the salvage value. The welfare-optimal number of retailers can lead to the above-cost clearance price.

Joint work with Andrei Bazhanov and Mikhail Nediak.

Date: Monday, January 19th

Speaker: Pascal Courty, University of Victoria

Topic: "Loss aversion and the uniform pricing puzzle"

Time: 3.30pm - 5.00pm

Place: Henry Angus **HA 969**

Abstract: The uniform pricing puzzle states that a monopolist sells high quality products at the same price as low quality ones despite the fact that quality is perfectly observable and that there are no significant costs of adjusting prices. The puzzle is relevant for movies, books, music, and mobile apps among others. We show that the puzzle can be resolved if consumers are loss averse relative to a reference 'fair' transaction and receive a valuation shock that is complement with product quality. The novelty of our approach is that the reference transaction is endogenously set as part of a personal equilibrium a la Koszegi and Rabin (2006) and includes only past purchases of products of the same quality.

Date: Monday, January 12th

Speaker: Michael Armstrong, Brock University

Topic: "Modeling Short-Range Ballistic Missile Defense and Israel's Iron Dome System"

Time: 3.30pm - 5.00pm

Place: Henry Angus **HA 969**

Abstract: This presentation describes a model of short-range ballistic missile defense that is used to study Israel's Iron Dome system. The deterministic base model allows for inaccurate missiles, unsuccessful interceptions, and civil defense. Enhancements consider the trade-offs in attacking the interception system, the difficulties faced by militants in firing large salvos, and the effects of imperfect missile classification. A stochastic model is also developed.

The modeling suggests that if the Iron Dome batteries performed as claimed during Operation Pillar of Defense in 2012, they saved Israel an estimated 1,778 casualties and \$80 million in property damage, and so made preemptive strikes on Gaza 8 times less valuable. Gaza militants could have inflicted far more damage by grouping their rockets into larger salvos, but this may have been difficult given Israel's suppression efforts. Counter-battery fire by the militants is unlikely to be worthwhile unless they can obtain much more accurate missiles.

Reference: Armstrong MJ, 2014. "Modeling short-range ballistic missile defense and Israel's Iron Dome system". Operations Research 62, #5 (Sep-Oct), 1028-1039.

Date: Monday, January 5th

Speaker: Xin Geng, Sauder School of Business

Topic: "Fairness issues in Operations Management"

Time: 3.30pm - 5.00pm

Place: Henry Angus **HA 969**

Abstract: In this talk, I will present three examples in operations management where fairness plays a role. First, I will introduce a sequential resource allocation problem with fairness constraint in non-profit operations and give some structural results. Then, I will look at a service system where servers care about fairness among themselves, and can endogenously choose capacities in response to the routing policy. I will focus on four commonly seen policies and examine their operational performance. Finally, from a fairness perspective, I will discuss two pricing schemes for a firm that has heterogenous servers who provide service with different quality.