

TUESDAY MORNING SESSIONS, 11:20 – 12:30

SESSION TA1: POLICY AND REGULATION

TA1-1: Can Environmental Regulation Enhance Competitiveness? Evidence from Chinese listed firms' green innovation

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Jing Dai

University of Nottingham Ningbo China

Junjie Zhang

Duke Kunshan University

Using a panel dataset of Chinese listed firms during the 1990-2010 periods, this paper investigates whether environmental regulations induce firms to develop innovation and whether benefits from green innovation may offset the cost of complying with environmental regulation and enable the firms to act more competitively. Environmental regulation chosen in this paper is Cleaner Production Audit programs China. Using a triple difference-in-difference method, our findings suggest that there is positive regulation effect on green innovation, but mainly occurs in the state-owned firms rather than private firms, and is only effective in terms of encouraging green innovations of utility patents rather than invention patents. Furthermore, we differentiate the effects of two types of green innovation on firms' competitiveness. Our empirical findings indicate that green invention patents are positively associated with firms' values, but green utility patents are negatively associated with firms' values. In sum, in response to mandatory environmental regulations, firms in China make incremental improvement to develop green utility patents, which in turns do not help firms increase their competitiveness. Both policy and managerial implications are provided in the paper.

Keywords: Green Innovation, Porter Hypothesis, Listed firms, China

TA1-2: Carbon emission reduction strategies for two competing firms with consumers' preference

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This paper develops price and low-carbon competition models between one socially responsible manufacturer and one regular manufacturer under the influences of consumers' low-carbon preference. We investigate how the regular manufacturer's low-carbon production choice is affected by factors such as cap-and-trade policy and competitive environment. We find that it may not be always beneficial for the regular manufacturer to join in low-carbon production. In a highly-competitive environment, the best choice for the regular manufacturer is to stay outside the low-carbon market. Though the regular manufacturer's participation in low-carbon production can lead to a higher consumer surplus, it is not always beneficial to the social welfare. The paper also investigates the effects of government's cap-and-trade policy on the firms' decisions and social welfare. We show that the government cannot motivate the regular manufacturer to join in low-carbon production by adjusting carbon quotas. The carbon quota can influence firms' emission reduction rate and price decisions only after they join in low-carbon production. In addition, we uncover that a lower carbon quota can help the new entrant to gain a competitive low-carbon advantage. However, the implementation of cap-and-trade policy is not always beneficial to the social welfare.

Keywords: carbon emission reduction, production, cap-and-trade, low carbon preference, game theory

TA1-3: Supply Chain Contracting under Emission Taxation: Promoting Suppliers' Environmental Innovation

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The Chinese University of Hong Kong

With growing concerns on pollutant emissions from manufacturing processes, emission taxation by governments is becoming increasingly popular, aiming to incentivize manufactures' environmental innovation. In some industries, however, motivating suppliers' innovation efforts could also be crucial, especially when the amount of pollutant emissions largely depends on the quality of the raw materials provided by suppliers (e.g., chemical raw materials such as petroleum products, automotive paints, and wafer cleaning solutions for semiconductor manufacturing). In such cases, one key question for governments and manufacturers is how to effectively induce suppliers' environmental innovation efforts under emission taxation. Thus motivated, this paper studies the role of supply chain contracts in promoting suppliers' environmental innovation. Specifically, we compare two contracting schemes that are frequently observed in practice (incentive-based vs. requirement-imposed) and investigate their impacts on suppliers' innovation and supply chain profits. Interestingly, we find that as the manufacturers' tax pressure becomes heavier or the outcome of innovation becomes more uncertain, incentive-based contracts tend to induce higher innovation efforts from the suppliers. Furthermore, we show that increasing the emission tax rate can discourage suppliers' innovation efforts as a manufacturer may choose to lower its production level instead of providing higher incentives for the supplier's innovation.

Keywords: environmental innovation; emission taxation; supply chain contract

SESSION TA2: INCENTIVIZING INNOVATION

TA2-1: Design of Long-term Conditional Cash Transfer Program to Defeat Diabetes

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Hong Kong University of Science and Technology

Diabetes is one of the largest health emergencies nowadays. For every individual, the expected expense on diabetes is high since each person has 30% chance to get diabetes and the health care expenditures are two-fold higher than people without diabetes. Notably, China has around 110 million people with diabetes, and the associated expenditure will increase sharply in the aging society. While diabetes can be prevented via good habits (e.g., weight control and increased physical activity), it remains ubiquitous due to individuals' present bias.

To prevent diabetes, we examine the feasibility of a long-term conditional cash transfer (CCT) program to help individuals adopt good habits by incorporating future costs into current decisions. We characterize the optimal CCT scheme to maximize social welfare and discuss possible financial sources, finding this program to be promising. However, if this program is held by a for profit company, the company may exploit customers' naivete to maximize its profit while hurting social welfare. We thus study its CCT design and discuss necessary interventions from the government. We extend our analysis to accommodate uncertain costs associated with good habits, good habits which can only be monitored indirectly, and the appropriate length of each period.

Keywords: diabetes, self-control, present-biased preference, conditional cash transfer, and sustainability.

TA2-2: Incentivizing Innovation for Neglected Diseases

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Singapore University of Technology & Design
Shantanu Bhattacharya
Singapore Management University

Many developing countries grapple with a diverse range of neglected diseases due to a lack of effective and safe biopharmaceutical products to address them. This leads to high mortality and morbidity among poor people in the developing world. The inability of patients to pay and the relatively small patient population at the disease level means that biotechnology and pharmaceutical firms do not have the drive to pursue the development of new products to address these diseases. Despite small populations at the disease level, in aggregate, neglected diseases affect more than one billion people, cost developing economies billions of dollars a year and hamper sustainable development for many developing nations. The world health organization calls on all stakeholders – non-government organizations (NGOs), biopharmaceuticals, and governments – to act in concert to eliminate neglected diseases. In this paper, we model the interaction between three stakeholders. An NGO, an Innovator (e.g. Biotech) and a Marketer (e.g. Large Pharmaceutical). First, we characterize the conditions for a disease to be neglected in the absence of incentives from the NGO. Subsequently, we evaluate the effectiveness of different incentive mechanisms in inducing collaboration between the Innovator and Marketer to bring products targeting neglected diseases to market.

Keywords: Innovation, Sustainable Development, Neglected Diseases, Incentives.

TA2-3: A Glimpse of the Technology Transfer in Shenzhen

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Shenzhen has been among the top 5 most innovative cities in China in the 21st century. According to Langrun-Longxin innovation index, in 2013, Shenzhen ranked No. 1 in terms of innovation per capita. However, for innovations to have real impact on technological advancements and economic growth, what is equally important, if not more important, is the transfer and transformation of technology from lab to market. The central government in China and local government of Shenzhen put in a lot of efforts to encourage the leap from lab to market. This paper tries to look at the trend of technology transfer in Shenzhen in the past decade. It introduces a new technology transfer index and compares the vibrancy of technology transfer in different industries. It also presents the network of technology transfer among districts in Shenzhen and between Shenzhen and other parts of China. From the network, one can clearly see the direction of technology transfer and the locations of innovative clusters.

Keywords: Innovation, technology transfer, index

SESSION TA3: RESPONSIBLE SOURCING AND SUPPLIER DEVELOPMENT

TA3-1: Motivating Suppliers' Sustainability Performance and Investments in Pollution Abatement Innovations via Strategic Sourcing

Shi Chen
University of Washington
Qinqin Zhang
Microsoft Corporation
Warren Hausman
Stanford University

We consider the actions of two suppliers investing in pollution abatement innovations and also choosing end-of-pipe pollution reduction levels when the buyer chooses different sourcing strategies. To encourage improvements in environmental performance of suppliers in emerging economies, the buyer either sources from both suppliers and allocates more market share to the one with better environmental performance, or sources from only one supplier and gives the one with better environmental performance a higher chance of winning the contract. We consider two dimensions of a buyer's choices: the sourcing strategy (single vs. dual sourcing) and the order allocation mechanism (either linear or proportional). Through equilibrium analysis of this stylized model, we study whether the action of one supplier on investing in pollution abatement will always improve both suppliers' end-of-pipe pollution reduction levels under the various scenarios described. We examine which sourcing strategy encourages more supplier investment in pollution abatement and which strategy results in a higher total production reduction level for the entire supply chain. We also study the buyer's optimal choices of contract terms -- the wholesale price and the order adjustment parameter of the order allocation mechanism -- to balance her economic objective with her sustainability objective.

Keywords: Pollution Abatement Innovations, Pollution Reduction, Sourcing Strategy, Procurement Contract

TA3-2: Achieving Sustainability and Cost Efficiency through Sourcing Plan and Supplier Development

Gang Li

Bentley University

Yu Xia

Northeastern University

To build a sustainable global supply chain, a firm needs to include the supply chain's sustainability performance as an important criterion when determining its sourcing strategy. A firm may also choose to invest in its suppliers to improve the entire supply chain's sustainability. On the other hand, operational factors, such as cost structure, capacity, supply risk, and delivery time of the suppliers, remain critical for a firm in determining its sourcing plan. In this research, we adopt the Environmental, Social, and Governance (ESG) index to quantify a supply chain's sustainability performance and further incorporate it with operational performance measures in the supply chain sourcing plan. In particular, the sourcing plan we study entails a firm selects suppliers from multiple potential candidates to form a supply chain and further determines the sustainability investment and order allocation among these selected suppliers to achieve both sustainability and cost efficiency. Instead of searching for just one sourcing solution, a frontier approach is used to provide a set of effective solutions, of which none is superior or inferior. We formulate the problem as a nonlinear integer-programming model, discover special features of the problem to speed the solution process, and propose an effective algorithm to solve the problem. Numerical tests verify that our algorithm outperforms the existing algorithm and provide managerial insights into how sustainability considerations alter the supply chain sourcing planning. A simulation of Apple's sourcing decisions in 2014 with iPhone 6 further confirms these insights and demonstrates the effectiveness of our decision model.

Keywords: Sustainability, ESG index, Supply chain management, Sourcing plan, Optimization model

TA3-3: Ethical Sourcing – Production Scale and Monitoring: Theory and Evidence

Hsiao-Hui Lee

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Qiang Fu, Jie Gong, Ivan Png,

National Singapore University

Previous research has emphasized price incentives, certification, and auditing as mechanisms to motivate suppliers to behave responsibly. Instead, we investigate another mechanism – the scale of production – and the tradeoff between scale and monitoring as mechanisms to induce responsible behavior. Our research proceeds through both analytical modelling and empirical analysis. Using a stylized model, we show that reducing the scale of production and monitoring are substitute mechanisms by which the brand can reduce the supplier's incentive for irresponsible behaviour. Hence, if monitoring is costlier, the brand will reduce monitoring and also reduce the scale of production. To examine the insights from the model, we collect and analyze data from Nike that cover production and employment at Nike contract factories in China between 2013 and 2016. Our empirical analysis is consistent with the theoretical proposition; among Nike contract factories in China, workforce size (representing scale) is negatively correlated with distance from national centres (representing monitoring cost).

Keywords: Production scale, social responsibility, supply chain incentives

TUESDAY AFTERNOON SESSIONS, 15:50 – 17:20

SESSION TP1: PROMOTING INNOVATIVE TECHNOLOGY

TP1-1: Promoting Innovative Technology in Developing Countries Through Solution Based Contract

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Hong Kong University of Science and Technology
Hau L. Lee
Stanford University

Agriculture sector plays a significant role in economy of developing countries. The development of agriculture production and improvement of per-capita income of farmers in less developed countries heavily rely on the revolution of farming forms and adoption of advanced agriculture technology. Even though technologies, such as drip irrigation systems, can improve the productivity incredibly through delivering water/ fertilizer precisely, most have not been widely adopted in developing countries. Several potential barriers make farmers reluctant to adopt it, e.g. limited knowledge or lack of proper skill to use it efficiently, high upfront investment considering farmers' financial constraints, and narrow market of selling the output. We first study the farmer's production decision and technology adoption incentives, and then investigate how technology providing firms can use business innovation to promote the technology adoption. We show that through solution based contract, firms can help farmers overcome the knowledge barrier. In addition, a yield based payment structure can reduce the farmer's financial cost from upfront investment, and share the risk under uncertain market price. Finally, we also analyze firm's joint decision on the technology promotion and raw material procurement decision in a supply chain context, and its impact on technology adoption and farmers' income.

Keywords: Technology promotion, solution based contract, business innovations, sustainable operations management

TP1-2: Sustainability Building of Agricultural-Product Supply Chain with Capital-Constrained Smallholder Farmers

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Yulan Wang

Hong Kong Polytechnic University

Ying-Ju Chen

Hong Kong University of Science and Technology

Nowadays many agricultural products are innovatively sold through intermediary electronic platforms. It is also common that a smallholder farmer lacks financial resources in planting products, which seriously threatens sustainability of the agricultural-product value chain. As one key part in this value chain, the intermediary electronic platform may innovate in ways to finance the farmer, such as providing a guarantor service or directly providing a loan. In this manner, partnership in the value chain critically differs from traditional ones. In this paper, we examine how the intermediary platform should innovate in financing the farmer to induce value chain sustainability. Specifically, we compare three financing formats -- bank financing, guarantor financing and direct financing. We find, for the platform, that guarantor financing is weakly dominated by direct financing. When the planting cost is relatively low, the platform prefers directly financing the farmer; when the cost is relatively high, it is more profitable to encourage the farmer to raise funds from the banking market. However, when the platform faces financing budget constraint, either of the three financing formats can be chosen. We also provide analysis about the best financing format for profitability of the smallholder farmer and sustainability of the whole value chain.

Keywords: capital-constrained smallholder farmers, agricultural product supply chain, sustainability

TP1-3: A "Firm+Farmers" Agribusiness Model with No Loss-Guaranteed Revenue-Sharing Contracts

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City University of Hong KongKekune Wu

Zhongnan University of Economics and Law

Ke Fu

Sun Yat-sen University

Motivated by a major agricultural firm's practice in China, we consider a "firm+farmers" agribusiness model which has attracted growing attention from the industry, governments, and the farmers in China. The involved firm offers contracts to a large number of small farmers. The farmers, based on their anticipated returns and risk preferences, choose to accept or reject the contracts. The contracts, on the one hand, retain a revenue-sharing feature between the firm and the farmers and, on the other hand, guarantee the farmers that their invested capital will not incur any loss. Neither the firm nor the farmers bear full production and market risks, but the firm bears greater risks and plays a leading role. We characterize the optimal supply chain decisions for the firm and the farmers under such contracts and reveal the critical factors for the success of the underlying mechanism. We show that, through the partnership, the farmers are able to not only gain wages for their labor but also receive a higher return from their limited capital in a sustainable way, and thus derive a steadily growing income stream. The firm benefits from an enlarged production scale by harnessing the scattered capital of the farmers and pooling the risks. Thus, the firm and the farmers will both be better off, leading to a win-win ecosystem and improved social welfare. Our results uncover the underlying theoretical mechanism and merits behind the success of these agribusinesses and address for the first time how such hybrid contracts may shape the agricultural supply chain and help drive sustainable development.

TP1-4: Menu Design to Combat Low Willingness to Pay for Technology Adoption in Developing Economies

Ying-Ju Chen

Hong Kong University of Science and Technology

Hsien-Hung Chiu

National Chi Nan University

In developing economies, a pervasive challenge to combat the extreme poverty is the product adoption puzzle: the unwillingness to adopt new cost-effective products/technologies. Several key barriers are well-documented: product quality, limited budget, and uncertain effectiveness. This paper proposes to use a menu of sales offers to facilitate the financial and material flows in the presence of heterogeneous customers that have different budgets and default risks. Our menu incorporates the traditional cash price offer, the right to return, the delayed payment, and the offer that combines the latter two features.

We show that when the seller is allowed to use menus, a uniform delayed payment offer may constitute an optimal selling strategy. This stand-alone offer is more likely to be optimal when customers are highly patient or the product quality is high. Nevertheless, moving outside this regime, menus should be provided. When at optimality the seller provides a menu of sales offers, a delayed payment offer is an indispensable part. We also find that the seller's profit from the optimal menu may be non-monotonic in product quality. Moreover, customers' surplus as well as the seller's profit may both increase when the seller provides a uniform sales offer rather than menu offering.

Keywords: Socially responsible operations, product adoption puzzle, menu design, quality uncertainty, seller financing.

SESSION TP2: INFORMATION TRANSPARENCY AND SUPPLY-CHAIN INCENTIVES

TP2-1: Impact of Supply Chain Transparency on Sustainability

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Qinqin Zhang
Microsoft Corporation
Yong-Pin Zhou
University of Washington

Companies are increasingly held accountable for social and environmental violations of their suppliers. In this paper we study the use of supply chain transparency to improve supply chain sustainability: Should a buyer reveal her supplier list, knowing that the identified suppliers may face more public scrutiny than the unidentified ones? We incorporate the interactions between a focal buyer and her supplier(s) under exogenous public scrutiny. We find conditions and various reasons for the buyer to optimally reveal her supplier list. First, the revelation invites more public scrutiny, which motivates the suppliers to improve their sustainability performance, and the buyer can also partially substitute the increased NGO scrutiny for her own costly audit. Second, the buyer can use transparency as a supplier screening mechanism: once revealed, those who cannot cope with the higher public scrutiny will drop out, and the remaining suppliers not only are inherently better, they will also exert more compliance effort. In addition, we find that when multiple buyers share a common supplier, one buyer's revelation reduces the incentives for other buyers to reveal due to a free-riding effect. To remedy, buyers can commit to joint auditing paired with transparency to further reduce cost and enhance audit efficiency.

Keywords: Supply Chain Transparency, Supplier List Disclosure, Social Responsibility & Environmental Sustainability

TP2-2: Evaluating Progress Information Sharing for Recovered Materials Usage in Eco-products

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W.C. Benton
The Ohio State University
Honggeng Zhou
Zhejiang University

The Resource Conservation and Recovery Act (RCRA) enacted in 1976 has set a national goal of reducing the amount of waste generated through source reduction and recycling. Thus, companies are encouraged to include recovered materials in products (“eco-products”). The delivery lead-times of recovered materials are typically more variable compared to virgin materials, thus it is important for buying organizations to synchronize orders and deliveries of both types of materials while maintaining product quality. We develop analytical models that show how the expected system cost decreases because of sharing delivery progress information between two suppliers with variable lead-times. When there are more than two suppliers, we use a simulation model to estimate the expected value of sharing progress information. Our results show that the percentage of cost saved increases with increasing information sharing frequency and number of suppliers sharing information, but decreases with increasing uncertainty in suppliers’ delivery lead-times. The computational study provides support for the existence of a critical mass level of suppliers needed to achieve a given percentage cost saving. This study can help eco-product manufacturers in making informed decisions on encouraging information sharing among suppliers, by first creating a critical mass of suppliers to share progress information.

Keywords: Information Sharing, Sourcing, Product Recovery.

TP2-3: OEM Selling Channels and Supply-chain Performance

Hsiao-Hui Lee
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Kevin Jean, Chia-Wei Kuo
National Taiwan University

This paper studies how an OEM's selling channel can serve as an instrument to enhance its product accessibility in the local market for developing countries. Under the prevalence of global sourcing, people in developing countries play an important role as suppliers, but not necessarily as end consumers. We consider an OEM that manufactures products for its brand buyer that sells to two markets: the domestic market where the OEM locates, and the international market where the buyer locates/operates. The OEM can offer the brand at a discount price in exchange of using the excess capacity to produce products under the OEM's brand and sells the product through the OEM's own selling channel. Contrary to the common concerns of market cannibalization, we find that authorizing the OEM selling channel can be a win-win strategy for both the brand (gaining more market share in the international market) and the OEM (earning more profits) because of economy of scales that lowers unit production costs. Such insights are generally robust even when we consider a cost for the OEM's selling channel as well as a price constraint from the brand to avoid the OEM selling the same product at too low a price.

Keywords: Dual selling channel, sustainable sourcing, supply chain incentives and contracting.

TP2-4: Should FMCG Manufacturers Accept Delayed Payments from Small Retailers in Emerging Markets?

Youssef Boulaksil
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Small retailers in emerging markets operate under very limited cash availability. While they offer informal loans to their customers, suppliers require immediate payment when order are delivered, which results in an inefficient distribution process. We develop a mathematical model and conduct an extensive simulation study to study this particular system. Our study reveals interesting insights into when a FMCG manufacturer should accepted delayed payments from small retailers.

Keywords: Small retailers, emerging markets, simulation study

SESSION TP3: SUPPLY CHAIN RISKS AND REMANUFACTURING

TP3-1: A Methodology for Water Risk Assessment in Manufacturing Supply Chains

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Technische Universiteit Eindhoven
Torben Schaeffer
Procter & Gamble

Surging demands from the growing population, increased pollution, and climate change all contribute to extreme demands on our fresh water resources.

Unlike greenhouse gas emissions, water risk is a local phenomenon. This implies that assessing the water risk of a supply chain requires assessing the risk of each manufacturing site within its local context.

Moreover, the recent tendency to shift production locally adds additional pressure to the environment. This is of particular interest in Asia, where population density is high, manufacturing is concentrated and expected to increase, and the regulatory frameworks are insufficient.

In this paper, we present a methodology to assess the water risk of a firms' upstream supply chain. We use a Monte Carlo Analytic Hierarchy Process methodology to quantify different physical and amplifying water risks, and aggregate them into a supplier water risk index score based on location.

Our methodology allows firms to identify the local and global context of their water risk, include water inventory measures, and derive the water risks in their supply chain. We present a case study where we embed our methodology as part of the supplier selection framework of a global consumer goods manufacturing firm.

Keywords: Water Risk Assessment, Local manufacturing, Sustainability in developing countries.

TP3-2: A Fuzzy TOPSIS Process for Evaluating Options to Overcome Risks in Adopting an Innovative Approach for Sustainability in a Supply-chain

Ifeyinwa Juliet Orji

MIT Global SCALE Network- Ningbo Supply Chain Innovation Institute China

The high population growth in China has led to huge increase in production and consumption of goods thus leading to environmental pollution. Sustainable consumption and production (SCP) is one of the innovative approaches to deal with increasing carbon emissions and improve performance along the value chain. However, the presence of risks makes the adoption of sustainable consumption and production trends in a supply chain challenging. Hence, this study proposes a fuzzy TOPSIS framework for evaluating options that are capable of overcoming risks in adopting SCP in a supply chain. The main purpose of the study is to find the total performance of the options with regards to the risks in adopting SCP in a supply chain and rank the options. Inputs in the current study are based on a gear manufacturing company in China. Research findings indicate that the highest performing option to mitigate risks in adopting SCP trends in a supply chain is 'Integrating SCP in proactive plans and respect for policy'. The current study is capable of encouraging decision makers and practitioners to implement SCP trends as an innovative approach to achieve sustainability.

Keywords: sustainable consumption and production (SCP), supply chain, fuzzy logic, Technique for Order Performance by Similarity to Ideal Solution (TOPSIS).

TP3-3: When Remanufacturing Meets Product Innovation

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Gendao Li
Northumbria University
Marc Reimann
Northumbria University, University of Graz

Remanufacturing is a key product recovery activity to prolong the useful life of products and improve sustainability. Yet, in past research it was found to be negatively affected by an industry's technology trajectory, which was exogeneously modeled. In this work we endogenize the product innovation decision.

Moreover, we focus on the impact of the quality of a product innovation on manufacturing cost. When manufacturing cost is constant or linear in quality, we confirm the existing results. Yet, when manufacturing cost is convex-increasing in quality we find that the existing result is reversed in general. Specifically, in such a setting, the manufacturer may even be induced to pick up remanufacturing after introducing a product innovation.

We also find that depending on its cost, remanufacturing stimulates different types of product innovation. When remanufacturing is efficient it tends to benefit incremental-type innovation, while under high remanufacturing cost the manufacturer may prefer a more radical innovation.

Finally, we analyze these questions from an environmental and social point of view. Our results highlight the dilemma for public decision makers in setting up sustainability policies, but provide valuable insights into scenarios where encouraging product recovery in terms of remanufacturing truly delivers on the triple bottom line.

Keywords: Remanufacturing; Product innovation, Environmental and social analysis

TP3-4: Remanufacturing Strategies for OEMs without Remanufacturing Capabilities

Yu ZHOU

Chongqing University

Anton OVCHINNIKOV

Queen's University, Canada

Yu XIONG

Northumbria University, UK

Many original equipment manufacturers, OEMs, have integrated remanufacturing into their business models. In practice, however, OEMs rarely remanufacture themselves; rather remanufacturing is commonly performed by third-party independent operators, IOs. It is therefore important for OEMs without remanufacturing capabilities to design mechanisms for how to cooperate with IOs, who are independent businesses that maximize their profits subject to available economic opportunities. This paper considers two common strategies for how OEMs and IOs cooperate: outsourcing and relicensing. Taking into account that the outsourcing and relicensing arrangements are determined endogenously in the interaction between one OEM and one IO, we formulate and solve the IO and OEM problems and document when each strategy should be used and why. We then present the results of a behavioral study ran in North America and China and estimate the key model parameter: brand power advantage - the differential in consumers' willingness to pay for a remanufactured product as a function of who sells it (OEM versus IO). Combining the analytical model and the behavioral estimates, this paper examines the different strategies used by some OEMs in the world's two largest economies, and generates valuable insights for OEMs and IOs as they decide for how to interact.

Keywords: Remanufacturing, closed-loop supply chains, outsourcing, relicensing, behavioral study.

WEDNESDAY MORNING SESSIONS, 11:20 – 12:30

SESSION WA1: VALUE CHAIN DESIGN

WA1-1: Money Well Spent? Operations, Fairness, and Social Implications of Fair Trade

Ho-Yin Mak
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Michael K. Lim
University of Illinois at Urbana-Champaign
Seung Jae Park
Ewha Womans University

We examine the operations, fairness, and social implications of fair trade certified products. We consider two types of products, regular and fair trade certified products, which are sold in independent markets but the two serves as perfect or imperfect substitutes. A fair trade organization decides standards for the certification to maximize the total premium transferred to producers, which is used to help poor farmers and workers. We characterize operations of various stakeholders in the fair trade value chain, as well as the role and value of fair trade organizations with different philosophies. We find that the fair trade organization's decisions depend on the relative magnitudes of the margins of the product, and discuss ways to increase the total premium to farmers. Furthermore, we examine the impact of mainstreaming, whether to allow large-scale plantations (owned by large corporates) to be eligible for fair trade certification or not, which is one of the most heatedly discussed topics in the fair trade movement. We identify the main beneficiaries in the value chain under different fair trade standards, and thereby address the fairness issue of the fair trade market as well as its resulting social welfare implications.

Keywords: fair trade certification, farmer premium, sustainable operation, value chain

WA1-2: Redesigning Sustainable Value Chains Using Game Theory Based Power Interaction Model in the One Belt-One Road Strategic Context

Tanmoy Kundu, Prof. Jiu Biing Sheu
National Taiwan University

This work presents a multi-methodological approach to address the dynamic challenges that underlie the problem of international logistic network reconfiguration induced by the one belt-one road (OBOR) initiative of the Chinese government. Hence, to minimize the negative externalities induced by the participating nations in the OBOR initiative, that could affect the distribution flows along various OBOR logistics corridors, a two-tier power interaction model is developed. Various Game Theoretical strategies such as Competition, Cooperation and Coopetition are considered to model various scenarios for redesigning value chain along the OBOR network. Further, to account for the effectiveness of the proposed model, two cases of Chinese oil supply chain are demonstrated. To address the sustainability issue, carbon footprint assessment is also conducted to suggest the most suitable distribution flow paths. The analytical results highlight and suggest various development strategies for the practitioners and the policy makers in redesigning their value chains in the OBOR context.

Keywords: One Belt-One Road, Value chain innovation, Power interaction, Logistics distribution flow, Game Theory

WA1-3: Urban Logistics Network Design and Optimization for Omni-Channel Retailing

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Chongqing Key Laboratory of Logistics, Chongqing University

Urban logistics is about finding efficient and effective ways to transport goods in urban areas while taking into account the negative effects on congestion, safety and environments. This article studies a joint location-routing problem for designing an Urban Logistics Network (ULN) with multiple intermediate depots (IDs) and terminals of ULN. The key decisions are where to locate the intermediate depots (IDs) and how to assign terminals to IDs with economic and environmental considerations. This paper presents a large-scale static and deterministic integer programming model solving a joint location-routing problem of Omni-Channel Retailers. To solve this model, we put forward a new routing cost estimation formula and a more efficient hybrid algorithm. Our methodology is illustrated with the Urban Logistics Network from a leading Chinese retailer (Suning) in Chongqing. Numerical analysis suggests that optimal solutions can reduce the total network cost between 2.92%~14.36% by comparison with the current ULN. Vehicle type is a deterministic factor to total urban logistics network costs. This paper also studies the economic and environmental effects of changing shipping rates and to point out some management implications.

Keywords: Online–Offline Channel Integration, location-routing problem, last mile delivery; Approximation Approach

SESSION WA1: INFLUENCING FACTORS AND GREEN INNOVATION

WA2-1: Green Innovation and Organizational Performance: Examining the Contingent Role of Environmental Uncertainty

Michael NG, Y.H. Venus LUN, Kee-hung LAI, T.C. Edwin CHENG
The Hong Kong Polytechnic University

There is a paucity of literature that comprehensively investigates the concept of green innovation (GI) in shipping operations. This study is, therefore, the first to empirically validate the measurements of GI adoption and examine the relationship between GI adoption and organizational performance (OP). Drawing on the contingency theory, this study also examines how environmental uncertainty moderates the impacts of GI adoption on OP. In the shipping industry, we identify four sub-dimensions of GI; namely, green management, service, process, and technological innovations. OP denotes the environmental, innovation, and economic performances of shipping firms.

We have conducted a large-scale survey of shipping firms in the Pearl River Delta region of China, which play a pivotal role in serving the global manufacturing base in China and supporting the regional economic development. A sample of 226 firms is collected for the SEM analysis. The results indicate a positive relationship between GI adoption and OP in terms of environmental, innovation, and economic performances. The relationship between GI and economic performance is, to a great extent, mediated by environmental and innovation performances. Under uncertain environments, a high level of adoption increases the positive impacts of GI on environmental and innovation performances, but not economic performance.

Keywords: green innovation, green shipping, organizational performance, environmental uncertainty, contingency

WA2-2: Institutional Forces and Green Supplier Integration in the Chinese Manufacturing Sector: The Dual Effect of Guanxi

Ruoqi Geng, Afshin Mansouri, Dorothy Yen
Brunel University London
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China is a global production base, and environmental issues have become a critical factor affecting the prosperity of Chinese manufacturers. Therefore, these manufacturers have adopted green supplier integration (GSI) to reduce negative environmental effects while improving their performance. However, the adoption of GSI is not an easy or straightforward task due to the complex institutional environment in China. As extant GSI research suggests a need to understand both formal and informal institutional forces, we examine how Guanxi as an informal institutional force moderates the effect of formal institutional forces on the adoption of GSI in Chinese manufacturing sector. Using data from 418 Chinese manufacturers, we illustrate the dual effect of Guanxi on the relationship between formal institutional forces and adoption of GSI. In particular, we find that Guanxi reduces the positive effects of supplier advices and community pressures, and it reduces the negative effects of perceived costs and complexity of regulations on GSI adoption. In doing so, our findings shed light on how cultural characteristics can affect the advancement of sustainability in the context of Chinese manufacturing sector and calls for innovative approaches that may overcome these barriers.

Keywords: Green supply chain management, Institutional theory, Guanxi, Chinese manufacturing sector, Survey

WA2-3: Green Technology Development and Adoption: Competition, Regulation, and Uncertainty -- A Global Game Approach

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When a government agency considers tightening a standard on a pollutant, the agency often takes into account the proportion of firms that are able to meet the new standard (what we refer to as the "voluntary adoption level"), because a higher proportion indicates a more feasible standard. We develop a novel model of regulation in which the probability of a stricter standard being enacted increases with an industry's voluntary adoption level. In addition, in our model, the benefit of a new green technology is both uncertain and correlated across firms, and firms' decisions exhibit both strategic substitutability (because of competition) and complementarity (because the stricter standard is more likely to be enforced as more firms adopt it). To analyze such strategic interaction under correlated uncertain payoffs, we use the global game framework recently developed in economics. Our analysis shows that regulation that considers an industry's voluntary adoption level, compared with regulation that ignores it, can more effectively motivate development of a new green technology. Surprisingly, uncertainty in the payoff can also help promote development of a new green technology. Finally, we find that more aggressive regulation may discourage a firm from developing a new technology.

Keywords: Environment, global game, regulation, sustainability, technology