CWEIST 2019 Accepted Paper Abstracts

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Product-driven Entrepreneurs and Online Crowdfunding Campaign

Title	Product-driven Entrepreneurs and Online Crowdfunding Campaign
Author(s)	Lin Hu; Zhenhua Wu; Bin Gu
Abstract	Advancements in information technology is known for enabling new business models and new market mechanisms. Online crowdfunding is one such new mechanism through which entrepreneurs can advertise their potential products and attract investors from the mass. In this study, we advance the existing theory on online crowdfunding markets by recognizing that online crowdfunding provides not only a venue of fundraising to entrepreneurs but also a venue for them to obtain demand information before production and to signal their intention. We formulate a spatial competition model between profit-driven entrepreneurs and product-driven entrepreneurs. We find that, while, on average, profit-driven entrepreneurs earn higher profits than product-driven ones, their advantage is constrained by the mechanism of the crowdfunding campaign, and product-driven entrepreneurs earn a significant fraction of the market. We also discuss model implications on consumer satisfaction and crowdfunding platform design.
Keywords	Crowdfunding, Entrepreneurs, Spatial Competition, Signaling

The Bidirectional Functionary Mechanism of Small-World Network Effect in the Free Economics of Information Products

Title	**The Bidirectional Functionary Mechanism of Small-World Network Effect in the Free Economics of Information Products**
Author(s)	Wei Li
Abstract	"Freemium" is a popular business model adopted by the vendors of information products, and this business model arouses extensive attention in the academia. The existing works commonly explore the business model from the perspective of network effect; however, these works lack the attention to the small-world features of network effect. In order to explore the functionary mechanism of the small-world feature in network effect, the current work presents a two-period optimized decision model of monopolist. The decision model is in connection with freemium and incorporating with the small-world feature of network effect. The decision model is solved using Lagrangian function. The comparative static analysis shows that the small-world network effect has bidirectional impact: if the integrating network effect caused by strong and weak relationship group is sufficiently high (or the small-world feature of the user group is strong), the user group network exerts a positive effect; otherwise, the user group network exerts a negative effect. The conclusions enrich the understanding on the operation of Internet enterprises in the academia and industry.
Keywords	Small-World Network effect, Freemium, information products, business model

Buyers' Loyalty, Sellers' Online/Offline Channel and Platforms' Business Model

Title	**Buyers' Loyalty, Sellers' Online/Offline Channel and Platforms' Business Model**
Author(s)	Yonghong Sun
Abstract	In this paper, we examine why a two-sided platform sets prices to attract full participation of both buyers and sellers in a homogeneous product market. The platform undoubtedly welcomes full participation of buyers because this implies that all transactions would take place via the platform. However, Full participation of sellers intensifies competition between them and therefore adversely affects their profits. This might be detrimental to the platform that needs to extract revenue from sellers. Given that buyers are heterogeneous (loyal VS. disloyal) and sellers set different prices for their online and offline channels. We build a game theoretic model to formulate the interactions between the platform, buyers and sellers. We find that full participation of buyers and sellers is the most profitable to and attainable by the platform. The existence of loyal buyers softens sellers' competition even if they all advertise on the platform. This makes it profitable for the platform to induce all sellers to participate.
Keywords	Two-sided platform, Two-sided pricing, Price dispersion, Buyer loyalty

Online Labor Market Signaling with App-based Monitoring

Title	**Online Labor Market Signaling with App-based Monitoring**
Author(s)	Zhenhua Wu; Chen Liang; Bin Gu

Title	Online Labor Market Signaling with App-based Monitoring
Abstract	App-based monitoring provides employers with detailed information on contractors' work progress and effort level. We extend the existing theory on monitoring by explicitly recognizing that app-based monitoring provides a new signaling opportunity to contractors as they are aware that employers can observe their behavior. In our new signaling model: 1) Online contractors can signal their types through wage quotes and/or effort level, given that the app-based online monitoring can perfectly reveal contractor's effort level; 2) The employer infers contractor's type from both wage quotes and observed effort level and disseminates the information in the online labor market. We find, in some cases, the high ability contractor proposes zero wage and the first best effort level to signal his ability. Besides, under certain conditions, the market outcome could reach the first best. However, the monitoring might distort the labor supply by incentivizing an effort level higher than the first best case.
Keywords	asymmetric information, online labor market, signaling, app-enabled monitoring

Platform Openness: from Reseller to Marketplace

Title	Platform Openness: from Reseller to Marketplace
Author(s)	Yonghong Sun
Abstract	We examine why an online retailer which just resells goods previously opens its platform to third-party (3P) sellers and why 3P sellers have incentive to join the retailer's platform. In recent years, several big online retailers choose to open their retailing channel to 3P sellers, such as Amazon in 2001, JD.com in 2010 etc. In this paper, we develop a game-theoretic model to formulate the strategic interaction between an online retailer and a 3P seller who are selling an identical product in the market. We find that the game rule is changed by openness. By charging the proper rent and commissions, the opener can always induce the other party to join, and then soften their price competition. In particular, the opener has more control over the other party's retailing price through charging the commission. Certainly, the one party having value advantage will take the role of the opener since only in this case the benefits of openness and cooperation for two parties can be maximized. Second, consumers are provided with one more channel to purchase by openness, but they are hurt since they have to pay a higher price than before openness. Third, the effect of the retailer's openness on social welfare depends on two factors. The positive one is the reduction in mismatch between consumers taste and different channels location. The negative one is the gross utility loss due to that some consumers switch their purchase from the retailer to the off-platform channel of the 3P seller.
Keywords	openness, third-party sellers, channel competition, marketplace

Duopoly Pricing Strategy for Providing Digital Media Online: Subscription-only or Subscription-prior?

Title	Duopoly Pricing Strategy for Providing Digital Media Online: Subscription-only or Subscription-prior?
Author(s)	Jingpei Ma; Wenli Li
	Many online media platforms offer prior content to subscribers, and also offer it for free with ads after a “windowing” period. While the delay-ad-sponsored service has the advantage of building up a broader consumer base and adds an additional way for platforms to make profits. However, it may also result in cannibalization of partial demand. This paper adopts a game theoretical approach to examine the impact of delay-ad-sponsored offering on the competition between two platforms. The platform can either offer a subscription-

Title	Duopoly Pricing Strategy for Providing Digital Media Online: Subscription-only or Subscription-prior?
Abstract	only strategy or a subscription-prior strategy with delay-ad-sponsored service. We will derive the market equilibria and present conditions under which the subscription-prior strategy outperforms the subscription-only strategy. We will find how the length of “windowing” period impact the platforms' offering decisions and the equilibrium solutions. This study contributes to understanding the behavior of delay-ad-sponsored offering in a duopoly setting. Our findings also provide insights on how to design the length of “windowing” period to make effective offering decisions.
Keywords	digital media platform, subscription fee, delay-ad-sponsored service, windowing period

Advertising or Subscription: The Optimal Revenue Model of a Video-Sharing Platform

Title	Advertising or Subscription: The Optimal Revenue Model of a Video-Sharing Platform
Author(s)	Yu Wang; Jie Zhang; Minqiang Li
Abstract	We examine a profit-maximizing video-sharing platform that considers adopting the revenue model: an advertising-supported model, a subscription model, or a hybrid one. Under the advertising model, viewers watch videos for free but have to bear with ads; while under the subscription model, viewers watch ad-free videos for a subscription fee. We build a game-theoretical model to consider how the chosen revenue model affects the platform owner's profit, each video provider's profit, each viewer's utility and the social welfare. We find that the platform owner may use one of the three revenue models when the ad-related quality loss is moderate, depending on the ad revenue rate. He chooses either the pure subscription or the pure advertising model when the ad-related quality loss is low, and always adopts the hybrid model when the ad-related quality loss is high. Besides, the pure subscription model may only be used when the marginal-quality production cost is low. We also find that the platform owner's above optimal revenue model selection is socially optimal in many situations. Each video provider's profit is maximized under the pure subscription model, and his profit may increase with the marginal-quality production cost. Each viewer has a weakly higher utility under the hybrid model than that under the pure advertising model, and her utility may be maximized under the pure subscription model when the ad revenue rate and the ad-related quality loss are both small or both large.
Keywords	Advertising revenue model, Subscription revenue model, Hybrid revenue model, Video-sharing platform, Two-sided platform

Compatibility Choices for Competing Software Service Vendors in the Context of Behavior-based Price Discrimination

Title	Compatibility Choices for Competing Software Service Vendors in the Context of Behavior-based Price Discrimination
Author(s)	Yu Wang; Jie Zhang; Minqiang Li
	This paper explores how competing Software-as-a-Service (SaaS) vendors make decisions on compatibility (compatibility, unilateral compatibility, or incompatibility) in the context of Behavior-based price discrimination (BBPD). The firms' relative efficiency which is defined as the ratio of cost difference to quality difference and the switching cost play critical roles. We find that both SaaS vendors tend to reward switchers under BBPD, but when unilateral compatibility prevails and switching cost is high, the less efficient firm may reward its repeat consumers. Interestingly, different pricing pattern may result in identical market shares and identical pricing patterns may result in different market shares in period 1; and the increase (decrease) of price may lead to the increase (decrease) of the market share of

Title	**Compatibility Choices for Competing Software Service Vendors in the Context of Behavior-based Price Discrimination**
Abstract	the increase (decrease) of price may lead to the increase (decrease) of the market share of the corresponding consumers in period 2. Then, when both firms embrace BBPD, both firms will mostly choose to be compatible when switching cost is high but incompatible when switching cost is low. When switching cost is moderate, the less efficient firm will be unilaterally compatible with its competitor, but not vice versa. Counterintuitively, when one firm's service efficiency is extremely high and switching cost is very low, the more efficient firm may be unilaterally compatible with the less efficient firm, and firms' respective interests and social planner's interest can be aligned under these condition. Finally, consumer surplus reaches the largest when firms are incompatible, while social welfare and industry profits reach the peak when firms are compatible or unilaterally compatible.
Keywords	SaaS, Behavior-based price discrimination, Compatibility Decision, Switching cost, Service efficiency, Duopoly market

Politics in the Age of Social Media: Implications on Party Policy and Election

Title	**Politics in the Age of Social Media: Implications on Party Policy and Election**
Author(s)	Chao Ding; Wael Jabr; Hong Guo
Abstract	Social media adoption in the political discourse brought about radical changes. The shift set in place by information technology resulted in a drastic increase in both the amount and timeliness of the information that political parties could communicate to the voter base. Using a game theoretical model, we analyze in this paper the impact of social media adoption by political parties on their policy positions and chances to win elections. We show that parties should balance between two countervailing effects of the policy positions they adopt: the ideology effect resulting in polarization and the election effect resulting in moderation. We also show that, counter to conventional wisdom, when parties use social media as a communication channel to reach citizens, they moderate their policies and at the same time enable citizens to be more informed.
Keywords	Social Media, Political Party, Election, Electoral Competition, Ideology, Polarization, Moderation

Security-sensitive vs. Security-general: A Study of Information Security Decision under Security Externality

Title	**Security-sensitive vs. Security-general: A Study of Information Security Decision under Security Externality**
Author(s)	Yong Wu

Title	**Security-sensitive vs. Security-general: A Study of Information Security Decision under Security Externality**
Abstract	The level of firms' information security investment has recently become a critical issue in the management of IT infrastructure. The goal of security investment for security-sensitive firms is to improve the survival probability as high as possible, while that for security-general firms is to reduce the security loss as far as possible. This paper examines how security-sensitive firms differ in timing of security investment from security-general firms, characterizing how asset uncertainty, security externality, and environment riskiness influence both security quality and investment timing. We find that a security-general firm has an incentive to invest in security only when its asset value reaches a certain level, while a security-sensitive firm always has an incentive to invest in security. Moreover, a higher riskiness of the environment first enhances then suppresses a security-general firm's incentive to invest in security, while always enhances that of a security-sensitive firm. A higher riskiness of the environment deteriorates the security quality of a security-general firm more quickly than that of a security-sensitive firm, and the impact of the riskiness of the environment on the expected profit of a security-general firm is also significantly different from that of a security-sensitive firm. Furthermore, we show that for either the security-sensitive firm or the security-general firm, its own security investment decreases with the security externality, while its aggregate security investment increases with the security externality when the cost coefficient is low and decreases when it is high.
Keywords	security investment, security-sensitive, security-general, security externality.

An Economic Analysis of E-learning Business Model with Refund Policy

Title	**An Economic Analysis of E-learning Business Model with Refund Policy**
Author(s)	Can Sun; Wanyi Chen

Abstract	E-learning has become more and more popular. The e-learning material can be provided by non-profit organizations or for-profit firms. We study a new business model that is currently employed. In the business model, learners subscribe to the firm's customized courses with subscription fee. Subscribers who accomplished the courses will be refunded. We compare the refund-policy policy with the subscription fee policy, and find that the refund policy can generate higher profit than the subscription fee case under certain conditions. We identify these conditions. Interestingly, we also find that when learners become more time-consistent, that is learners' short-term discount rate increases, firm's profit could decrease, increase or first increase and then decrease. We compare the social welfare between the subscription fee case with the refund policy. We find the refund policy can lead to higher social welfare than the subscription case.
Keywords	e-learning, time-inconsistency, pricing, refund policy,subscription fee policy

An Economic Analysis of Used Digital Consumer Electronics Trading with Privacy Concern

Title	**An Economic Analysis of Used Digital Consumer Electronics Trading with Privacy Concern**
Author(s)	Shidao Geng; Wenli Li; Jingpei Ma; Cong Wang

Title	An Economic Analysis of Used Digital Consumer Electronics Trading with Privacy Concern

Abstract	Since used digital consumer electronics grow fast, it is very common that owners recycle their used digital product to a professional electronic dealer. After refurbishing the used product, the dealer resells this product with a higher retailing price. With the help of e-commerce, nowadays owners could sell idle digital consumer electronic through an online used product trading platform to a stranger directly. Since personal information existed in the used digital product, owners could worry about their privacy leakage. We build an economic model to describe the competition between the two used product trading channels under privacy concern. Under the circumstance in which owner is more than seeker, we get the closed-form expression of the optimal wholesale price, retailing price and utility update degree in dealer channel, and the optimal retailing price of online trading platform channel. It is interesting that the wholesale price which dealer offered to the owner is decreased when the used product value increases.
Keywords	Privacy,Used Product Trading,Competition

Porting or Not Porting? Availability of Exclusivity in the Digital Service Market

Title	Porting or Not Porting? Availability of Exclusivity in the Digital Service Market
Author(s)	Yu-Chen Yang; Hao Ying; Yong Jin; Hong Guo
Abstract	The digital service market becomes enormous and continues growing, while mobile games dominate the mobile app market and contribute over half of the mobile app revenues. In the digital service market, the platforms, such as Netflix, Steam etc., would like to cooperate with the digital service developers to have the software exclusively stay at their own platforms to entice more consumer demands and obtain more profits. For example, the game developer “Electronic Arts” agrees to offer Apple iOS a two-month exclusive window for the well-known mobile game “Plants vs. Zombies 2”. The benefits of the exclusivity to the platforms and digital service developers are unclear and not studies in the extant literature. We develop an analytical model of digital service profits to examine the optimal exclusive duration for platforms and digital service developers. Our result shows that platforms prefer making an exclusive deal while developer prefers staying across different platforms. Platforms and developers have the totally different preferences for the exclusive duration, but digital service can only be sold on a platform or platforms with the agreement for the duration of the exclusive deal. Platforms and developers are two decision makers in the exclusive-duration game. We further explore the strategies for platforms and digital service developers in the simultaneous game and sequential games. We find that both platforms and developers prefer to lead the game, because the game leader can obtain maximum profit among all games.
Keywords	Digital service platform, exclusivity, two-sided market, network externalities

Supply Chain Transparency in the Blockchain Era: An Economic Analysis of Competitive Implications

Title	Supply Chain Transparency in the Blockchain Era: An Economic Analysis of Competitive Implications

Title	Supply Chain Transparency in the Blockchain Era: An Economic Analysis of Competitive Implications
Author(s)	Jie Huang, De Liu, Yu Tang, Hongyan XU

Abstract	With the rapid evolvement of information technology, such as Blockchain, the demand for supply chain transparency is becoming more and more strong. It is crucial for the firms to be clear about both informational and operational consequences of whether making its supply chain transparency, since the revelation of supplier information may lead to switching supplier of the competitor. On the other hand, doubtlessly, information asymmetry always exists between upstream and downstream of a supply chain. We want to explore the rationale of supplier information revelation under above distinguishing characteristics of competing supply chains in the Blockchain Era. Information is modeled along two dimensions in our model where each of the competing chains consists of one supplier and one manufacturer: internal information on supplier's production yield and external information on supplier's production cost. We find that the revelation of the supplier (cost) information generates information leakage effect, common supplier effect of internal information and cost reduction effect; the manufacturer's decision on disclosing its supplier or not depends on the trade-offs between these effects and the interplay is moderated by the supplier switching cost. Our results show that when the supplier switching cost is high, the revelation of supplier information benefits the manufacturers through the information leakage effect alone. When the supplier switching cost becomes low, the manufacturer may still prefer the revelation and choose to switch to the competitor's supplier if his own one is cost-disadvantaged or keep the supplier information private.
Keywords	blockchain, information transparency, asymmetric information, supply yield, supply chain competition, supplier switching

Seeding and Selling Network Goods: A Channel Coordination Perspective

Title	Seeding and Selling Network Goods: A Channel Coordination Perspective
Author(s)	Zhuoran Lu; Yifan Dou; D.J. Wu; Jian chen
Abstract	The ubiquitous smart technology has blurred the boundary between the hardware and software. It changes not only the manufacturer's cost structure and production process, but also the way consumers use the product. This paper makes a first attempt in a channel context to study the management strategies (i.e., seeding and pricing) for the smart product. Our game-theoretic model captures two immediate effects of the smart technology: diminishing marginal production cost, and increasing network effects among consumers. We show that both effects play a nontrivial role. Specifically, we find that the double-marginalization effects could be fully internalized under retailer seeding, and the subgame perfect Nash equilibrium of the general seeding is a bang-bang-type equilibrium. It implies that the channel of smart product could be self-organized to eliminate the double-marginalization effects.
Keywords	seeding, network goods,channel coordination

Do You Have a Room for Us in Your IT? An Economic Analysis of Shared IT Services and Implications for IT Industries

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Title	**Do You Have a Room for Us in Your IT? An Economic Analysis of Shared IT Services and Implications for IT Industries**
Author(s)	Min Chen; Min-Seok Pang; Subodha Kumar
Abstract	In this study, we develop a game-theoretic model to analyze the governments' decision to share IT services and understand how the introduction of shared services transforms the strategic interactions between the governments and the vendor. We study three common regimes used in the adoption of shared IT services: (i) a cost-sharing regime where costs are split proportionally, (ii) a profit-center regime where one government charges a surplus-maximization price to the other, and (iii) a coordination regime where governments coordinate their decisions to maximize aggregate surplus. Our analyses generate several intriguing findings. First, although charging a surplus-maximizing price seems to be a lucrative option, we find that a government does not always benefit by acting as a profit center. Second, the cost-sharing regime does not always incentivize the shared service adoption despite being often viewed as a fairer and more convenient arrangement. Third, we find that there can be significant under-utilization of shared services in the absence of proper coordination, in a sense that the governments may choose not to share their IT services even if doing so would increase their aggregate surplus. Lastly, even though coordination promotes the adoption of shared IT services, it can sometimes be inefficient from the social welfare's perspective because the increase in governments' surplus can be outweighed by the decrease in the vendor's profit. We also present a range of extensions to our model to show that our main takeaways carry over when some model assumptions are relaxed.
Keywords	Shared IT Service, Outsourcing, Governments, Economies of Scale, Social Welfare, Game Theory

Incentivizing Upstream Information Sharing in a Make-to-Order Supply Chain

Title	**Incentivizing Upstream Information Sharing in a Make-to-Order Supply Chain**
Author(s)	Jian (Ray) Zhang, Barrie R Nault
Abstract	We study a two-echelon make-to-order (MTO) supply chain that includes a manufacturer and its supplier, which are MTO firms that deliver customized orders. When a customer places an order to the manufacturer, the manufacturer places a corresponding order to the supplier, and each echelon responds in turn with a customized delivery. We characterize the customization as delivery preferences, and each firm has an ideal delivery preference - their minimum cost of satisfying the order - that varies randomly based on unobservable factors. For a given order, the manufacturer's cost depends on the gap between the ideal delivery preferences, and the supplier can reduce the gap by adjusting its delivery at a cost. We study how sharing the manufacturer's ideal delivery preference upstream through inter-organizational systems impacts each firm's pricing and profit, and the supply chain's profit. In our MTO supply chain, the manufacturer has an incentive to share information upstream if the variability of the ideal delivery preferences gap and the supplier's cost of delivery adjustment are low enough. When the manufacturer does not have an incentive to share information upstream, the supplier can commit to a price ceiling or a subsidy to the manufacturer to provide the incentive. Committing to a price ceiling is a better strategy for the supplier and the supply chain.We study a two-echelon make-to-order (MTO) supply chain that includes a manufacturer and its supplier, which are MTO firms that deliver customized orders. When a customer places an order to the manufacturer, the manufacturer places a corresponding order to the supplier, and each echelon responds in turn with a customized delivery. Each firm has a delivery preference -- the delivery minimizing the cost of satisfying the order -- that varies randomly based on unobservable factors. For a given order, the supplier can adjust its delivery to satisfy the manufacturer's delivery preference based on its own delivery preference and the available information about the

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	manufacturer's delivery preference. We study how the cheap-talk-based and inter-organizational-system-based upstream information sharing strategies impact each firm's pricing and profit, and the supply chain's profit. In our MTO supply chain, the inter-organizational-system-based information sharing is a better strategy for both the manufacturer and the supplier comparing to the cheap-talk-based information sharing, and no sharing is the best strategy for the manufacturer if the supplier's cost of delivery adjustment is high enough. When the manufacturer does not have an incentive to share information upstream, the supplier can commit to a price limit or a subsidy to the manufacturer to provide the incentive. Committing to a price limit is a better strategy for the supplier and the supply chain.
Keywords	Upstream Information Sharing, Make-to-Order, Decentralized Coordination, Incentives