



## Special Section: The Economics of Sharing and Information Security

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## Special Section: The Economics of Sharing and Information Security

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As the moving parts of a given economy, all individual agents are sitting in the same boat. Their needs and wants, as they may arise and disappear over time, are connected by common resources, infrastructure, and information. The strength of the interconnections can be modulated by third parties, the latter being thought of as less flexible and more reliable pieces of the economy, including intermediaries, market makers, and information aggregators. This Special Section, on the Economics of Sharing and Information Security, features three papers about the economic incentives to “engage” as a consequence of strategic actions taken by these third parties. In this context, the word “engage” stands for the agents’ participation—as suppliers or buyers—in an economy where material and immaterial goods, including durable products, time, and security, are shared with others.

Until about a decade ago, whenever purchasing a power drill or a car, an agent would have had to decide about whether her somewhat random future needs, for drilling holes or driving a car, would be worth investing in the ownership of the corresponding durable good. She needs to consider all possible alternatives, such as hiring a service to drill holes or a taxi to get around, whenever such need arises. Since then, what has changed? The answer is, unsurprisingly: a lot! With the advent of sharing markets, agents now have a third option, namely renting a durable good from a peer, which amounts to a decreased commitment in ownership, and more generally, more flexibility to consume. This flexibility is associated with a stronger link between needs (as they come up) and the spending that goes with satisfying them. This results in better use of resources, including not only the agents’ cash but also the utilization of the goods themselves, with the drill’s lifetime usage increasing dramatically, and the car’s need for idle storage dropping. The idea of engagement with others through sharing clearly goes beyond the mere exchange of goods. It includes the exchange and use of one’s own time as well. A more flexible use of a driver’s time in a market with strong interconnections to the needs of others increases her willingness to engage.

We must understand that the intrinsic value of sharing markets comes from the added flexibility in both use (for non-owners) and provision (for owners), and that stronger interconnections between the two sides of the markets (i.e., owners and non-owners) create more flexibility. Then we must also ask how the third parties can take actions so as to encourage the two sides to engage with each other. For example, how would a ridesharing intermediary encourage the owners of vehicles to offer their services to their non-car-owning peers? Or, what mechanisms can be employed by a manufacturer, so as to better respond to the existence of a market for sharing the durable goods he sells? This may mean smarter devices, to better enable the flows of information related to the collaborative consumption and longer product lifetimes, to balance the streams of revenue

from retail and sharing, and to support a more flexible way of charging for products and their collaborative consumption.

The preceding questions go to the core, or rather the long-term viability, of a “sharing economy” with strong connections among individuals. Participation must be high, or else the connections weaken endogenously, and the economy drifts back into a more discrete “ownership economy,” with all the resource inefficiencies this may entail. They concern the “second-order” effects, beyond the more mundane “first-order” questions of who is sharing what with whom, and at what price, which have already been discussed elsewhere. But rather, they inquire about how should products be designed and marketed, so as to be attractive in an economy with strong interconnections. And, similarly, how should relationships with suppliers, such as drivers, be designed so as to encourage high participation and therefore the sustained existence of the sharing economy as a whole?

Information security is in fact no different! Agents (including firms) are increasingly interconnected, and therefore also vulnerable to direct and indirect attacks from outside. An indirect attack may start with a direct attack on agent A, using this agent’s connections with agent B to eventually penetrate the latter’s security defenses indirectly, via shared infrastructure. Thus, a portion of each agent’s security investment is shared with other agents, who—as far as these shared portions go—get to free-ride on the others’ goodwill. This gives rise to a “tragedy of the commons,” that is, a security *underinvestment* relative to what would appear optimal for a benevolent social planner’s authoritative choice. Hence, how can a third party increase the perceived strength of the connections between the different agents, when doing so tends in fact to increase incentives for investing in the common good? One possible answer, as it turns out, may be to simply provide better information about each other, creating transparency about poor performance and thus improve incentives to catch up, and from there a ratcheting effect toward more security investment.

The papers included here present three distinct attempts to answer these questions, from different angles and using different methodologies, but with unifying insights on the importance of interconnections and the resulting payoff externalities. The special section opens with “Drivers of Supplier Participation in Ride-Hailing Platforms” by Soo Jeong Hong, Johannes M. Bauer, Kwangjin Lee, and Nelson F. Granados. The authors conducted a randomized quasi-experimental and exploratory empirical study related to Uber’s driver contracts and the ridesharing platform’s flexibility and financial-security incentives to encourage their participation. This paper is among the first to study both active and inactive drivers, as well as the opportunities they have to either single-home with Uber or multi-home with Uber and other ridesharing platforms. The theoretical perspective that they leverage focuses on the decision logic of drivers’ utility maximization, blended with their willingness-to-work when the platform guarantees them a minimum wage, a company-sponsored benefits plan, and personal privacy while enabling them to screen passengers who may be inappropriate or risky to provide their services to. The authors report that drivers were willing to contractually commit to a minimum number of hours of service provision while sacrificing some scheduling flexibility, and that drivers put a lot of emphasis on the working conditions they face as ridesharing suppliers in their primary job when deciding about whether to participate. Conversely, the choice between single-homing and multi-homing is also shown to be associated with the drivers’ preferences for providing the services demanded by Uber.

The second article is on “How to Market Smart Products: Design and Pricing for Sharing Markets,” authored by Thomas A. Weber, a guest editor of this Special Section,

whose recent research output has included new theoretical foundations for a range of questions related to the sharing economy. They cover: sharing economy product pricing and consumer choice of buying goods versus accessing them on a sharing market—paired with firms' incentives to provide product durability; and the value of insurance contracts for sharing intermediaries to decouple their rent-extraction problem from the underlying inter-agent moral-hazard problem. His present article considers product ecosystems that enable user-sensing, and make it possible for sharing intermediaries to control aftermarket consumption patterns. The author notes that suppliers can take value-maximizing decisions about how to design durable products for sharing, including a flexible pricing schedule—charging separately for the purchase and subsequent sharing authorizations. His optimization model, which includes the use of optimal control, implies that good product designs balance the trade-off between the respective demands for product reusability and aftermarket transferability. This research also offers a 2-by-2 “shareability-control matrix” as a simple navigation aid for a supplier's actions, by-quadrant, where rent extraction is either ownership-based or usage-based, and consumption is based either on exclusive ownership or on shared access. This matrix may help a senior manager to better assess the trade-offs between shareability and aftermarket control, and should provide a valuable decision tool for industry managers to determine the best balance, by product design, between revenues from retail and from sharing.

The third and final contribution is entitled “Understanding Security Vulnerability Awareness, Firm Incentives, and ICT Development in Pan-Asia,” by Yunhui Zhuang, Yunsik Choi, Shu He, Alvin C.M. Leung, Gene M. Lee, and Andrew B. Whinston. The authors evaluated the impacts of a privately and/or publicly-communicated security-vulnerability index on a firm's incentives to implement tightened information-security measures, in light of the market's experience with spam email and phishing website attacks. Their randomized field experiment was conducted with 1,262 firms in six countries in Asia, half of which received random treatments involving email with their security vulnerability index and relative security ranking. They report that the treated firms did exhibit increased information security over time, with a significant reduction in outgoing spam volume involving their firms, but not phishing website hosting. They further indicate that countries with a relatively high level of ICT development were more responsive to third-party information, likely due to their enhanced capabilities to address the problems with their more advanced IT resources and routines to address security vulnerabilities.

As noted at the outset, all three papers illustrate the modulation of interconnections in a “New Economy” by third parties, where agents conduct new types of flexible transactions, the collaborative use of personal assets, the flexible pricing of retail purchases in conjunction with aftermarket sharing transactions, and the investment in interdependent security systems. Just as in electromagnetism the laws of interaction in the “near field” are quite different from what happens in the “far field,” it is natural to expect a different economic intuition for regimes with “close interaction” and interlinked consumption patterns, than for standard regimes with isolated consumption patterns for the different agents. As a small indicator of such different laws, consider again the second contribution, which contains a nonlinear pricing schedule in the context of sharing. The standard results in such situations predict that “high types” (the most valuable consumers for the company) obtain the largest information rent. This continues to hold as far as the information rent in the retail price is concerned: consumers that are most likely to need a product from period to period should pay the lowest retail price. However, those consumer types are precisely the ones that are least likely to offer their items on the sharing

market, so that they in fact obtain the lowest information rent in the “sharing tariff,” that is, the fee the firm extracts from a sharing transaction will be maximal for those “retail-valuable” consumers, as they are not very “sharing-valuable.”

Zooming away from the specifics of the problems and solutions discussed here, we note that although the economics of “information systems” (IS) has been a part of the discipline for five decades, the economic problems that continue to arise in New Economy settings offer fertile ground for theory-based modeling and methods-expanding empirical exploration. This Special Section of the *Journal of Management Information Systems* continues to expand the spectrum of IS topics, supported by recent advances in data analytics, randomized field experiments, and the use of variational methods, to further both scientists’ and senior managers’ understanding of newly emerging business practices.

## About the Authors

**Robert J. Kauffman** (rk.digi@cbs.dk; corresponding author) holds the Endowed Chair in Digitalization at the Copenhagen Business School and is Emeritus Professor at Singapore Management University. He previously served as Professor and Director of the MIS Research Center at the Carlson School of Management, University of Minnesota, where he chaired the Information and Decision Sciences Department. Dr. Kauffman’s graduate degrees are from Cornell and Carnegie Mellon. His research focuses on technology and strategy, the economics of IT, financial services and technology, managerial decision-making, sustainability economics, and e-commerce. His work has appeared in *Information Systems Research*, *Journal of Management Information Systems*, *MIS Quarterly*, *Management Science*, *Review of Economics and Statistics*, *IEEE Transactions on Software Engineering*, *IEEE Transactions on Engineering Management*, and many other journals. He has won multiple Best Research Paper Awards in the Organizational Systems and Technology Track at Hawaii International Conference on System Sciences.

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