

# Toulouse Network for Information Technology

Annual Meeting, September 28-29, 2012  
Washington D.C.

## *List of abstracts*

### **Josh Lerner (Harvard)**

*Lost in the Clouds: The Impact of Copyright Scope on Investment in Cloud Computing Ventures*  
(with Chris Borek, Laurits Christensen, Peter Hess and Greg Rafert)

Abstract: Our analysis seeks to understand the impact of changes in copyright scope on investment in new firms. We begin by analyzing the investment effects of the Cartoon Network, et al. v. Cablevision decision in the U.S. and court rulings in France and Germany on venture capital (VC) investment in U.S. cloud computing firms relative to the EU. Then, we separately analyze the effects of the French and German court rulings on VC investment on cloud computing firms in these countries. Our findings suggest that decisions around the scope of copyrights can have economically and statistically significant impacts on investment and innovation.

### **Daron Acemoglu (MIT)**

*Network Security and Contagion* (with Azarakhsh Malekian and Asu Ozdaglar)

Abstract: This paper develops a theoretical model of investments in security in a network of interconnected agents. The network connections introduce the possibility of cascading failures depending on exogenous or endogenous attacks and that profile of security investments by the agents. The general presumption in the literature, based on intuitive argument or analysis of symmetric networks, is that because security investments create positive externalities on other agents, there will be underinvestment in security. We show that this reasoning is incomplete because of a first-order economic force: security investments are also strategic substitutes. In a general (non-symmetric) network, this implies that underinvestment by some agents will encourage overinvestment by others. We demonstrate by means of examples that not only there will be overinvestment by some agents but also aggregate probabilities of infection can be lower in equilibrium than in the social optimum. We then provide sufficient conditions for underinvestment. This requires both sufficiently convex cost functions (just convexity is not enough) and networks that are either symmetric or locally tree-like (i.e., either trees or in the case of stochastic networks, with high probability not having cycles locally). We also characterize the impact of network structure on equilibrium and optimal investments. Finally, we show that when the attack location is endogenized (by assuming that the attacker chooses a probability distribution over the location of the attack in order to maximize damage), there is another reason for overinvestment: greater investment by an agent shifts the attack to other parts of the network.

### **Luis Garicano (LSE)**

*Information Technology and Investment in a Credit Crunch: Evidence from Spanish Firms*  
(with Claudia Steinwender)

Abstract: In recent years, firms in the periphery of the European Union have had a difficult access to capital. This paper studies the ways in which the restricted access to capital financing of Spanish firms in recent years has affected their investments. In particular, we

show that they have reduced R&D and IT investment. We also show that they outsource more software and application development. In the period immediately following the 2007 financial crisis, the uniformity of financing between center and periphery firms in the EU has been replaced by fragmentation. Using a high quality, 20 year long, panel data set of Spanish firms we document the slow deterioration of the conditions under which firms in the European periphery operate compared to their foreign based peers. More precisely, we use a difference-in-differences approach to control for demand effects and we compare highly indebted Spanish manufacturing firms which are foreign owned (and thus have alternative financing channels) to those which are Spanish owned in a detailed panel of strategies before and after the financial crisis. We show that, holding constant size and industrial sector, and using firm fixed effects to control for unobserved heterogeneity, the capital constrained Spanish owned firms reduce employment, but not wages; reduce investment, but not advertisement; they reduce R&D (product and process innovation), and information technology investment. We also show that they increase software programming and application outsourcing.

### **Nicholas Bloom (Stanford)**

*Trade Induced Technical Change? The Impact of Chinese Imports on Innovation, IT and Productivity* (with Mirko Draca and John Van Reenen)

Abstract: We examine the impact of Chinese import competition on broad measures of technical change - patenting, IT, R&D, TFP and management practices – using new panel data across twelve European countries between 1996-2007. We correct for endogeneity using the removal of product-specific quotas following China's entry into the World Trade Organization. Chinese import competition (1) led to increased technical change *within firms*; and (2) reallocated employment *between firms* towards more technologically advanced firms. These within and between effects were about equal in magnitude, and appear to account for 15% of European technology upgrading over 2000-2007 (and even higher when allowing for offshoring to China). Rising Chinese import competition also led to falls in employment, profits, prices and the share of unskilled workers. By contrast, import competition from developed countries had no effect on innovation. We develop a simple "trapped factor" model that is consistent with these empirical findings.

### **Jonathan Levin (Stanford)**

*Sales Mechanisms in Online Markets: What Happened to Internet Auctions?* (with Liran Einav, Chiara Farronato and Neel Sundaresan)

Abstract: Consumer auctions played a major role in the early days of internet commerce, but today's online environment has shifted toward posted prices. Data from eBay shows that compositional shifts in the items being sold, or the sellers offering these items, cannot account for this evolution. We develop a simple model that captures the trade-off between auctions and posted price sales mechanisms, and use a parsimonious specification to assess its quantitative implications. The results suggest that buyer demand has evolved to favor posted prices, perhaps due to greater competition for online consumer attention, and this can explain a significant fraction of the shift toward price posting. The remainder can be explained by narrower retailer margins, perhaps due to more intense competition or improved consumer search. We also discuss why sellers may continue to use both mechanisms as a form of price discrimination.

### **Glenn Ellison (MIT)**

*The Internet and the Used Book Market* (with Sara Fisher Ellison)

Abstract: This paper examines the impact of the internet on used book market. Improvements in search technologies would be expected both to improve the efficiency of the allocation of books to high-value consumers and to create increased price competition.

These effects are analyzed in a dataset containing data on 350 titles at both online and traditional used book dealers.

**Suzanne Scotchmer (Berkeley)**

*Essential Facilities: Not a Doctrine, Not Even a Category*

Abstract: I reprise the "essential ideas" doctrine, with reference to the main cases, and bin them in two ways, first as to economic content, and second as to whether an essential facilities doctrine is either changing the nature of intellectual property rights or substituting for transactions that the market should sensibly produce. I evaluate whether, in the first case, an essential facilities doctrine seriously overlaps other regulatory bodies of law, and in the second case, whether such a doctrine has more potential to do harm than good.

**Michael Whinston (Northwestern)**

*Internal versus External Growth in Industries with Scale Economies: A Computational Model of Optimal Merger Policy* (with Ben Mermelstein, Volker Nocke and Mark Satterthwaite)

Abstract: We study optimal merger policy in a dynamic model in which the presence of scale economies imply that firms can reduce costs through either internal investment in building capital or through mergers. The model, which we solve computationally, allows firms to invest or propose mergers according to the relative profitability of these strategies. An antitrust authority is able to block mergers at some cost. We examine the optimal policy when the antitrust authority can commit to a policy rule and when it cannot commit, and consider both consumer value and aggregate value as possible objectives for the antitrust authority. We find that optimal policy can differ substantially from what would be optimal considering only welfare in the period the merger is proposed. We also find that the ability to commit can lead to a significant welfare improvement. In general, firms' optimal investment behavior can be greatly affected by the antitrust policy, and the optimal policy (absent commitment) can in turn be greatly affected by firms' investment behavior.

**Kristina McElheran (Harvard)**

*Information Technology and Boundary of the Firm: Evidence from Plant-Level Data* (with Chris Forman).

Abstract: We study the relationship between different margins of information technology (IT) use and vertical integration using plant-level data from the U.S. Census of Manufactures. Focusing on the short-run decision of whether to allocate production output to downstream plants within the same firm or to external customers, we find that customer-focused IT, by itself, has surprisingly little impact. In contrast, adoption of upstream supplier-focused IT at a plant is associated with a significant decline in downstream vertical integration. However, the greatest decline in within-firm transfers occurs when supplier- and customer-facing IT are adopted together, suggesting the presence of complementarities in supply chain technology adoption. These results are consistent with the view that, by reducing external coordination costs, IT investments promote a decline in plant-level vertical integration, but only when those investments are made jointly with both suppliers and customers. Our results provide less support for the view that IT investments led to a decline in vertical integration by lowering transactions risks.

**Justin Rao (Microsoft Research)**

*Are the Data Stacked Against You? Causal Inference in the Advertising Market*

Abstract: We use 25 online advertising field experiments, which together account for more than 2.8 million dollars in spend, to understand the inference problems an advertiser faces of evaluating advertising performance and determining the right levels of spend. Our findings are that even when ad delivery and purchases can be measured and linked for an individual (which is not true yet of media such as billboards or most television commercials), and delivery can be fully randomized, forming reliable estimates on the returns to advertising is

exceedingly difficult. We explore the precision of beliefs on advertising effectiveness we could reasonably expect to exist in this market and conclude that the signals are exceptionally weak as compared to those implied by standard models of advertising or in typical market-based investments. We discuss the implications of these inference challenges on market fundamentals and use publically available data to show that our advertisers are by no means anomalous.

**Ilya Segal (Stanford)**

*A Proposed Double Auction for Electromagnetic Spectrum*

Abstract: The development of mobile Internet access is impeded by the lack of available spectrum. To solve this problem, in accordance with the National Broadband Plan and a February 2012 statute, the Federal Communications Commission is preparing to acquire broadcast spectrum licenses from TV stations, repack the stations that continue broadcasting to free up contiguous spectrum for mobile broadband uses, and auction off the resulting broadband spectrum. This will be done through the use of an auction whose design offers a number of novel challenges, such as (i) the computational impossibility of optimal frequency assignment for thousands of TV stations to minimize the cost of clearing a given amount of spectrum, (ii) the problem of providing transparent incentives to bidders in such an auction, (iii) the problem of determining the amount of spectrum to clear while balancing the budget and satisfying a net revenue requirement, and (iv) achieving all these goals in a coordinated auction that completes in reasonable time. The talk will discuss the policy issues involved and some novel theoretical results that provide the underpinnings for designing such an auction.

**Susan Athey (Harvard)**

*Peaches, Lemons, and Cookies: Designing Auction Markets with Dispersed Information*  
(with Ittai Abraham, Moshe Babaioff and Michael Grubb)

Abstract: This paper studies the role of information asymmetries in second price, common value auctions. Motivated by information structures that arise commonly in applications such as online advertising, we seek to understand what types of information asymmetries lead to substantial reductions in revenue for the auctioneer. One application of our results concerns online advertising auctions in the presence of "cookies," which allow individual advertisers to recognize advertising opportunities for users who, for example, are customers of their websites. Cookies create substantial information asymmetries both ex ante and at the interim stage, when advertisers form their beliefs. The paper proceeds by first introducing a new refinement, which we call "tremble robust equilibrium" (TRE), which overcomes the problem of multiplicity of equilibria in many domains of interest. Second, we consider a special information structure, where only one bidder has access to superior information, and show that the seller's revenue in the unique TRE is equal to the expected value of the object conditional on the lowest possible signal, no matter how unlikely it is that this signal is realized. Thus, if cookies identify especially good users, revenue may not be affected much, but if cookies can (even occasionally) be used to identify very poor users, the revenue consequences are severe. In the third part of the paper, we study the case where multiple bidders may be informed, providing additional characterizations of the impact of information structure on revenue. Finally, we consider richer market designs that ensure greater revenue for the auctioneer, for example by auctioning the right to participate in the mechanism.