ANNUAL REPORT

JEAN-JACQUES LAFFONT DIGITAL CHAIR
& TSE DIGITAL CENTER

Toulouse School of Economics | Digital Center

THE JEAN-JACQUES LAFFONT
DIGITAL CHAIR

IAST

CONTENTS

EDITORIAL

TSE researchers have been studying the digital economy for over two decades. They have made major scientific contributions, as illustrated for instance by the pioneering work of Bruno Jullien, Jean-Charles Rochet and Jean Tirole on the theory of two-sided markets. These contributions were made possible by the help of the IDEI's research partners. Before the Internet even existed, France Telecom was one of the first two, and starting in 2000 with Microsoft, more partners contributed, both financially and intellectually, to these advances.

The launch of the Jean-Jacques Laffont Digital Chair in 2015 with the support of major institutional and corporate donors (French Ministry of Culture, ACCOR, Samsung, Orange, CDC, SACD, SACEM and Société Générale) built on this tradition through a new multilateral research partnership in the field of digital economics. The TSE Digital Center, created this year with the generous support of Airbus, will allow us to continue the work of the Jean-Jacques Laffont Chair with the help of a wider range of partners than in the past.

The overarching objective of the Digital Center is to spur high-quality research on tomorrow's issues in the digital economy. We strongly believe that a multidisciplinary approach is necessary to foster our understanding of the digital economy and, accordingly, the Center's 45 researchers are not only economists, but also mathematicians, jurists, and psychologists. The Center aims at contributing to the Common Good not only through theoretical and applied research published in the best journals, but also through the dissemination of our cutting-edge research to firms, policymakers and the wider public.

You will find in this report an overview of the Digital Center's and the Jean-Jacques Laffont Chair's activities in the academic year 2017-2018, as well as a glance to our current research projects and future events. We wish you a pleasant read and thank you very much for your support.

Yassine Lefouili
*Director of the TSE Digital Center
and the Jean-Jacques Laffont Digital Chair*

Jacques Crémer
*Former Director of the Jean-Jacques Laffont Digital Chair
and Scientific Director of the TSE Digital Center*

HIGHLIGHTS
TSE DIGITAL FORUM

This half-day event brought together academic economists, decision-makers and regulators to share insights and discuss the major challenges of the digital economy, in particular the role of Big Data and its impact on firms.

Wilfried Sand-Zantman *(TSE)* and **Eric Gautier** *(TSE)* presented their recent research on the issue, followed by a roundtable discussion between **Jacques Crémer** *(TSE)*, **Amal Taleb** *(SAP)* and **Hubert Tardieu** *(Atos)*.

Wilfried Sand-Zantman (TSE)
The Role of Data in Business

> **The value of data depends on the decisions it drives**

TSE professor and competition expert **Wilfried Sand-Zantman** gave some perspective on the revolution triggered by the advent of Big Data, considering that: *"Data is giving rise to a major change, often compared to the oil revolution, but there are several key differences. Although they may be similar in the changes they bring about, unlike oil, data is produced by any activity. To all extents and purposes, it is a by-product. It can also be shared with no loss. Finally, data is not a new commodity, as banks, insurers and telephone operators have been exploiting it for a long time."*

Wilfried Sand-Zantman then highlighted the impact of data: *"The value of data depends on the decisions it drives."* But when an economic actor is the sole holder of data these decisions will not be the same as when data is shared: *"Information is a double-edged sword insofar as economic actor react to information held by others. This reaction could largely cancel the benefits of having privileged information."* If data is shared by all competitors, this leads to aggressive tariff offers that erode profits to the benefit of consumers.

The economist concluded by elaborating on how targeted advertising is made possible by data, recalling the two types of targeting: *"Positive targeting, which consists of selecting the target audience and negative targeting, which excludes consumers who would not be interested. Optimal targeting depends on the target market."*
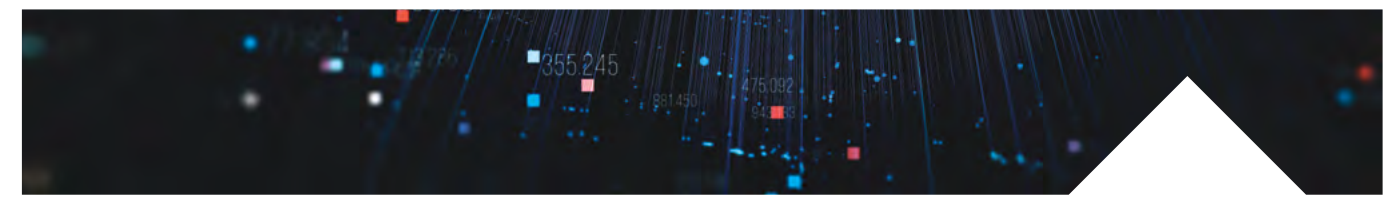
> **The issue with Big Data is that once data is over a certain volume size all processing which should be simple becomes extremely complex**

Eric Gautier (TSE)
Big Data and Decision-Making

Eric Gautier presented the challenges of processing a large volume of data: *"If we suppose that a dataset consists of many rows (observations) and many columns (variables), this poses two, very different problems. Having a high number of rows is a bonanza, as statistical uncertainty is low. However, this could raise a potential computational problem requiring distributed algorithms or intelligent sub-sampling. Having many variables poses a very different problem. Econometrics and traditional statistics assume the number of variables are fixed and relies on probabilistic approximations. These are no longer valid when the number of rows is low compared to the number of columns."*

Eric Gautier then presented the challenges of optimization and solutions based on convex relaxations and parsimony: *"This is based on the assumption that the many unknowns in modelling are well approximated by a simple object, for example a number of parameters are zero or low-ranking matrices."*

Eric Gautier concluded by presenting the current research focus in the economic analysis field, where tools developed for statistical learning are not suitable, particularly for causal analysis and counterfactual studies.

Roundtable on Maximising Data Value

Moderated by Jean-Marc Vittori *(Les Echos)* - Jacques Crémer *(TSE)* - Amal Taleb *(SAP)* - Hubert Tardieu *(ATOS)*

The exchange of views between the three panelists was rich and lively. **Jacques Crémer** addressed the pessimism and fear currently surrounding the issue and reminded participants that data, when well regulated, should improve trade and so drive growth: *"How many books have you read that you would never have heard of without the recommender systems made possible by personal data?"*

Amal Taleb gave a legal perspective on the issue: *"Personal data was easily defined in the past. Legally, it was all information that could be used to target an individual within a group: name, client number, membership number etc. Today it is far more complex."*

Hubert Tardieu picked up on the comments of Jacques Crémer, stating that personal data is not considered problematic when it provides a service: *"The big problem companies need to overcome is that they are not thinking about the service they could provide to users before asking for their data. When service takes priority over data, the use of personal data is not an issue."*

Hubert Tardieu then explained why he believes that the crossover of personal data and company data will be a key issue in debates, especially in the legal context. Amal Taleb clarified this, noting that consent was not the be all and end all of legislation on the subject.

In conclusion, Jacques Crémer explained that a great deal of research is needed to understand the implications of these massive volumes of data and their exchange: *"Much long term research on this issue is required and this is what we have set out to do at TSE."*

SCIENTIFIC
TEAM

Head of the research program Analytics and Economics of Big Data

Sébastien GADAT

Sebastien Gadat is a Professor of statistics and applied mathematics at Toulouse School of Economics and the head of the mathematics of decision making and statistics research group.

He is an Associated member of the Institut de Mathématiques de Toulouse. He works on applied mathematics involved in machine learning and artificial intelligence, with an emphasis on statistics and stochastic on-line optimization algorithms. He has led several research programs (ANR, Plan-Cancer and PGMO grants) and collaborates with several industrial partners (Airbus, Thales, CNES, ENAC among others).

He has recently been appointed a junior member of the Institut Universitaire de France (2018-2023).

Head of the research program Financial Technologies and Digital Markets

Christophe BISIÈRE

Christophe Bisière is a professor of finance at Toulouse Capitole University. He holds a research master's degree in computer science, and a research master's degree in finance. He received his doctorate in economics from Aix-Marseille University in 1994. He spent a year as Economic fellow at the U.S. Securities and Exchange Commission, in Washington D.C., working on U.S. markets regulation issues.

His research has been published in international academic journals such as European Financial Management, Management Science, and the Review of Financial Studies. His recent work focuses on blockchain and cryptocurrencies. His recent paper "The Blockchain Folk Theorem" *(joint with Bruno Biais, Catherine Casamatta, and Matthieu Bouvard)* received the Swiss Finance Institute Outstanding Paper Award 2017.

Head of the research program Digital Platforms

Bruno JULLIEN

Bruno Jullien is a Senior Researcher at CNRS and TSE, and a Fellow of Econometric Society, MaCCI, CEPR, CESIfo and CMPO. He currently holds an Advanced ERC Grant. His interests cover industrial organization, in particular network economics, IT, competition policy and the economics of multi-sided platforms.

Bruno Jullien graduated from Ecole Polytechnique, ENSAE and EHESS. He holds a PhD in economics from Harvard University. He acted as Director of GREMAQ, Deputy and Scientific Director of TSE, he was a member of the Economic Advisory Group on Competition Policy of the European Commission and of the Steering Committee of Association of Competition Economics and of EARIE.

Head of the research program Artificial Intelligence and Society

Jean-François BONNEFON

Jean-François Bonnefon (Ph.D., cognitive psychology) is a Research Director at the French Centre National de la Recherche Scientifique, and is currently based at the MIT Media Lab as a visiting scientist.

He is otherwise affiliated to the Toulouse School of Economics, the Toulouse School of Management, and the Institute for Advanced Study in Toulouse. He works on decision-making and moral preferences, and explores the kind of ethics people want for self-driving cars and other machines

45 RESEARCHERS INVOLVED

- Bruno Biais
- Christophe Bisière
- Jérôme Bolte
- Jean-François Bonnefon
- Marcel Boyer
- Emilio Calvano
- Giacomo Calzolari
- Stéphane Caprice
- Catherine Casamatta
- Daniel Chen
- Frédéric Cherbonnier
- Alexandre De Cornière
- Claude Crampes
- Jacques Crémer
- Fany Declerk

- Vessela Daskalova
- Roberta Dessi
- Isis Durrmeyer
- Daniel Ershov
- Sébastien Gadat
- Daniel Garrett
- Fabien Gensbittel
- Renato Gomes
- Johannes Hörner
- Marc Ivaldi
- Doh-Shin Jeon
- Bruno Jullien
- Augustin Landier
- Yassine Lefouili
- Estelle Malavoti

- Nour Meddahi
- Sophie Moinas
- François Poinas
- Jérôme Renault
- Patrick Rey
- Mathias Reynaert
- Andrew Rhodes
- Anne Ruiz-Gazen
- David Salant
- Wilfried Sand-Zantman
- Paul Seabright
- Jean Tirole
- Christine Thomas-Agnan
- Stéphane Villeneuve
- Lei Xu

KEY NUMBERS

10 partners

45 researchers

1 international academic conference

1 international forum

29 digital workshops

16 working papers

19 publications

3 policy papers

VISITORS

BOSTON UNIVERSITY
Timothy SIMCOE
01/09/2017 ➜ 31/07/2018

Université de Montréal
Marcel BOYER
22/01/2018 ➜ 28/01/2018
06/03/2018 ➜ 09/03/2018

THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL
Gary BIGLAISER
08/03/2018 ➜ 14/03/2018
25/06/2018 ➜ 29/06/2018
04/07/2018 ➜ 08/07/2018
13/07/2018 ➜ 21/07/2018

LSE
London School of Economics
Mark SCHANKERMAN
01/01/2018 ➜ 31/07/2018

UCL
University College London
Jeremy WATSON
19/06/2018 ➜ 24/06/2018

OUR PARTNERS

ACCOR HOTELS Feel Welcome

AIRBUS

GROUPE Caisse des Dépôts

orange

RÉPUBLIQUE FRANÇAISE Ministère Culture

SACD Société des Auteurs et Compositeurs Dramatiques

sacem Société des Auteurs, Compositeurs et Éditeurs de Musique

SAMSUNG

SOCIETE GENERALE

Microsoft

Toulouse Network for Information Technology (TNIT):

The Toulouse Network for Information Technology (TNIT) was created in 2005 to stimulate high-quality economic research on the software industry, the development and role of the Internet, and intellectual property. The aim of the network is to encourage some of the best academic economists in the world to engage on the issues generated by the rapid development of information technology.

The work of the network is funded by Microsoft Corporation, and jointly coordinated by TSE. It meets every year in Redmond to discuss each other's research and dialog with high-level practitioners about the evolution of the industry.

Members of the TNIT network: Daron Acemoglu *(MIT)*, Susan Athey *(Stanford University)*, Nicholas Bloom *(Stanford University)*, Glenn Ellison *(MIT)*, Joshua Lerner *(Harvard Business School)*, John Levin *(Stanford University)*, Matthew Gentzkow *(Stanford University)*, Heidi Williams *(MIT)*.

Scientific coordinator: Jacques Crémer *(TSE)*

SCIENTIFIC
PROJECTS

PRIVACY AND PERSONAL DATA COLLECTION WITH INFORMATION EXTERNALITIES

TECHNOLOGY ADOPTION IN INPUT-OUTPUT NETWORKS

THE BLOCKCHAIN FOLK THEOREM

LEARNING ALGORITHMS IN MARKETS

The projects presented in this section are just a few examples of the numerous ongoing research projects of the Digital Chair & Digital Center.

Privacy and personal data collection with information externalities

→ **Jay Pil Choi** *(Michigan State University)*
→ **Doh-Shin Jeon** *(TSE)*
→ **Byung-Cheol Kim** *(University of Alabama)*

This research project provides a theoretical model of privacy in which excessive loss of privacy occurs even if personal data collection requires consumers' consent and consumers are fully aware of the consequences of such consent. The main mechanism for this excessive loss of privacy relative to the social optimum is information externalities from users to non-users.

Namely, users' decisions to share their personal information allow the data controller to infer more information about non-users. It explores this mechanism in two different setups. In the first setup of monopoly, it shows that the mechanism can induce too many consumers to consent to collection of too much personal information. In the second setup, it considers numerous small websites which have no individual incentive to adopt the business model of personal data collection due to scale economies in data analytics.

However, this project shows that the emergence of data brokerage industry can induce them to adopt the business model and that the information externalities lead to excessive entry of such websites, resulting in excessive loss of privacy. Policy implications of this analysis are discussed in light of the recent EU General Data Protection Regulation (GDPR).

The Blockchain Folk Theorem

→ **Bruno Biais** *(CNRS-CRM-TSE)*
→ **Christophe Bisière** *(CRM-TSE)*
→ **Matthieu Bouvard** *(McGill University)*
→ **Catherine Casamatta** *(CRM-TSE)*

Blockchains are decentralised protocols recording transactions and ownership. In contrast with centralised protocols, blockchain operates within a network, whose participants each possess and update their own version of the ledger. The blockchain design was the main innovation underlying the digital currency network Bitcoin, but its potential benefits in terms of cost-efficiency, speed and security, for a variety of assets and contracts, have attracted interest from a broad range of institutions and businesses. Each block, in the blockchain, offers an updated version of the ledger, taking into account recent transactions, and chained to a previous block.

The focus of this research project is on public blockchains, such as Bitcoin or Ethereum, which are fully decentralised and anonymous - in contrast to private blockchains, in which a central authority can authorise participants and certify transactions. It studies whether public blockchains can be expected to generate stable consensus among decentralised participants. To do so, game theory is used to analyse the strategies of the miners, who decide to which previous block a new block is chained.

It shows that the blockchain is a coordination game. There exists an equilibrium in which miners coordinate on the longest chain rule, following Nakamoto's recommendation, but there also exist equilibria with forks. The theoretical analysis thus sheds light on the occurrence of forks, observed in practice.

Technology Adoption in Input-Output Networks

➜ **Xintong Han** *(Concordia University)*

➜ **Lei Xu** *(Toulouse School of Economics)*

This project investigates the role of network structure in technology adoption. It contributes to the literature of technology adoption by showing a new channel where the speed of adoption can be affected, namely the input-output network of individual agents. It is also one of the first papers that integrates a complex network in dynamic discrete choice models.

It studies this issue in the context of the Python programming language, in particular, the transition from Python 2 to Python 3. It builds a dynamic model of technology adoption where packages adopt Python 3. Packages are linked through dependency requirements and thus form an input-output network. With a complete dataset of package characteristics and user downloads, the project estimates the model and test the effectiveness of various policies that can help promote a faster adoption.

Learning Algorithms in Markets

➜ **Emilio Calvano** *(University of Bologna - TSE)*

➜ **Vincenzo Denicolò** *(University of Bologna)*

➜ **Luca Lambertini** *(University of Bologna)*

➜ **Sergio Pastorello** *(University of Bologna)*

➜ **Giacomo Calzolari** *(University of Bologna -TSE)*

Pricing software powered by Machine Learning Algos (ML) are more and more diffused not only in sectors such as Energy or Finance but also in mass online marketplaces such as Amazon or Ebay. Their massive growth is due on the one hand to the entry in the supply chain of pricing service providers which offer affordable personalized solutions and on the other hand to the availability of "off the shelf" ML products and services at low prices by tech giants such a Google or Microsoft.

The aim of this project is to study the consequences of having autonomous agents (i.e. pricing algorithms) powered by machine learning techniques populating markets, both from the positive and the normative viewpoint. The study goes across three disciplines: computer science, statistics/econometrics and Law & Economics.

The key issue is whether machine learning pricing algorithms can learn to cooperate and implement tacit collusion and thus be used by firms and sellers in general to defy competition.

EVENTS

WEEKLY DIGITAL WORKSHOPS

◆ **Francesco Decarolis** *(Bocconi University)*, *"Marketing Agencies and Collusive Bidding in Online Ad Auctions"*, December 12, 2018

◆ **Marcelo Olarreaga** *(University of Geneva)*, *"Online exports and the Skilled-Unskilled wage gap"*, December 5, 2018

◆ **David Stromberg** *(Institute for International Economic Studies - University of Stockholm)*, *"Social media and protests in China"*, November 29, 2018

◆ **Anja Lambrecht** *(London Business School)*, *"Spillover Effects and Freemium Strategy in Mobile App Market"*, November 14, 2018

◆ **Luis Aguiar** *(EU Joint Research Centre)*, *"Platforms, Promotion, and Product Discovery: Evidence from Spotify Playlists"*, October 17, 2018

◆ **Yutec Sun** *(KU Leuven)*, *"Market Entry, Fighting Brands and Tacit Collusion: The Case of the French Telecommunications Market"*, October 3, 2018

◆ **Lei XU** *(TSE)*, *"Technology Adoption in a Hierarchical Network"*, September 26, 2018

◆ **Xavier Lambin** *(TSE)*, *"Digital Platforms: Does Promoting Competitors Promote competition?"*, September 19, 2018

◆ **Arrah-Marie Jo** *(Telecom Paris Tech)*, *"Information disclosure and incentives in innovation contests - an empirical analysis of Bug Bounty programs"*, September 12, 2018

◆ **Emil Palikot** *(TSE)*, *"How effective are reputation systems? A closer look into ethnic discrimination on a platform"*, June 27, 2018

◆ **Jeremy Watson** *(University of Minnesota)*, *"It was Fifty Years Ago Today: Recording Copyright Term and the Supply of Music"*, June 20, 2018

◆ **Timothy Simcoe** *(Questrom School of Business)*, *"Upstream, Downstream: The Diffusion and Economic Impacts of the Universal Product Code"*, June 13, 2018

◆ **Katja O'Mann** *(Copenhagen Business School)*, *"Benign Effects of Automation: New Evidence from Patent Texts"*, May 30, 2018

◆ **Daniel Ershov** *(TSE)*, *"Competing with Superstars in the Mobile App Market"*, May 23, 2018

◆ **Matthew Evans** *(Airbus)*, *"Skywise: Connecting the aviation industry"*, April 4, 2018

◆ **Martin Watzinger** *(University of Munich)*, *"How Antitrust Enforcement Can Spur Innovation: Bell Labs and the 1956 Consent Decree"*, March 28, 2018
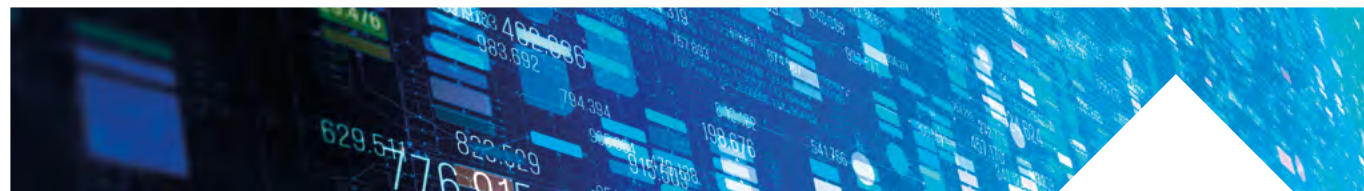
◆ Gabrielle Demange *(Paris School of Economics)*, *"Enhancing dual activities in a social network"*, March 7, 2018

◆ Ying Lei Toh *(TSE)*, *"Incentivizing Firms to Protect Consumer Data: Can Reputation Play a (Bigger) Role?"*, December 20, 2017

◆ Gil Ohana *(CISCO)*, *"The SEP Wars: How we got Here, Where we are Now, and Where we are Going"*, December 13, 2017

◆ Robert Somogyi *(Université Catholique de Louvain)*, *"Zero-rating, social welfare and net neutrality"*, December 6, 2017

◆ Xavier Lambin and Emil Palikot *(TSE)*, *"Does reputation hinder entry? Study of statistical discrimination on a platform"*, November 29, 2017

◆ Tong Wang *(University of Edinburgh)*, *"Knowledge Spillovers in the Open Source Community"*, November 15, 2017

◆ Cosmina Dorobantu *(European Commission)*, *"Competition and Specificity in Online Auctions: Evidence from Geotargeted Advertising"*, November 8, 2017

◆ Pulak Ghosh *(Indian Institute of Management, Bangalore)*, *"Big data and Economics: Opportunity and challenges for Policy Makers"*, October 11, 2017

◆ Melinda Matyas *(UCL Energy Institute)*, *"Developments in Smartphone-based Travel Surveys and an Application to New Mobility Services in London"*, October 4, 2017

◆ Jen Schradie *(IAST)*, *"Innovation Labor: Risk and the State in the Digital Economy"*, September 27, 2017

◆ Robin Stitzing *(Nokia Technology)*, *"Economics of standardization"*, September 20, 2017

◆ Alexandre de Cornière *(TSE)*, *"Application bundling in platform markets"*, September 13, 2017

◆ Jakob Hennig and Milena J Petrova *(TSE)*, *"Reputation and Moral Hazard on an Online Marketplace for Services"*, September 6, 2017

SCIENTIFIC EVENTS

→ THE 11th DIGITAL ECONOMICS CONFERENCE, TOULOUSE, JANUARY 11-12, 2018

The objective of the conference is to discuss recent contributions to the understanding of the digital economy and its consequences for modern societies.

→ 3rd ECONOMICS OF PLATFORMS WORKSHOP, ROME, APRIL 12-13, 2018

The workshop brings together leading economists on the economics of platforms to present and discuss the most recent advances in the field and their business and policy implications. It includes both theoretical, empirical and policy research contributions.

→ TSE DIGITAL FORUM, PARIS, JUNE 22, 2018

This outreach event in Paris gathers world-class economists and practitioners working at the forefront of the digital sector to offer their insights and debate the current stakes in big data.

→ TNIT ANNUAL MEETING, REDMOND, SEPTEMBER 28-29, 2018

The Toulouse Network for Information Technology (TNIT) organizes a yearly meeting in the United States on the Microsoft campus where they discuss each other's research and dialog with high-level practitioners about the evolution of the industry.

SAVE THE DATES

→ THE 12th DIGITAL ECONOMICS CONFERENCE, **TOULOUSE, JANUARY 10-11, 2019**

The inauguration of the Digital Centre will take place during the conference.

A round table on *"From pipeline to platform: how do firms adapt to the digital revolution?"* will be organized for the occasion.

• *Speakers:*
Jacques Crémer *(TSE)*
Andrei Hagiu *(Boston University Questrom School of Business)*
Patrick Legros *(Université libre de Bruxelles)*
Jean-Luc Vincent-Franc *(Airbus Digital Transformation Office)*

→ WORKSHOP ON THE ECONOMICS OF ARTIFICIAL INTELLIGENCE AND DATA, **BRUSSELS, MAY 6-7, 2019**

→ TSE DIGITAL FORUM, **PARIS, MAY 17, 2019**

APPOINTMENTS & RESEARCH GRANTS

▶ Bruno Biais *(CNRS-CRM-TSE Researcher)*, Christophe Bisière *(CRM-TSE Researcher)*, Matthieu Bouvard *(McGill University)* and Catherine Casamatta *(CRM-TSE)* have received funding from the Institute Europlace of Finance for their research project on Blockchain technology. The research's subject will study blockchain stability systems and their capacity to preserve a consensus regarding the information they obtain.

▶ Jacques Crémer, TSE Researcher and CNRS Senior Researcher, has been appointed Special Advisor to Commissioner Vestager on future challenges of digitalization for competition policy.

▶ Sébastien Gadat, TSE Researcher & Professor of Mathematics at Toulouse Capitole University, has been appointed Junior Member of the French Institut Universitaire de France for five years by the French ministry of Research and Higher Education from October 2018.

▶ Marc Ivaldi, Research Director at the École des Hautes Études en Sciences Sociales, has been elected the Fourth President of the International Transportation Economics Association.

▶ Jean Tirole, TSE Chairman, joins Melinda Gates and Jack Ma on the High-Level Panel on Digital Cooperation launched by the United Nations

OUTREACH

EDUCATION

ECONOMICS OF INTERNET

This course aims at exploring how the internet and digitization affect firms, consumers and markets. The first part of the course will involve a mix of theoretical models and policy discussions dealing primarily with network effects, online media platforms, big data and privacy. The second part will explore empirical papers on topics such as search, reputation mechanisms and copyright. Master students will also learn about the different kinds of data that are available with online markets and how to look at this data.

MARKET REGULATION IN THE DIGITAL WORLD

This course at the Master's degree level was created in 2016. The course discusses recent regulatory issues and competition policy topics related to the digital economy. Lectures cover the following topics: net neutrality, uses of personal data online, bundling in platform markets: economic analysis of the Microsoft and Google cases, news aggregators and their effect on traditional media and the sharing economy.

ECONOMICS OF INNOVATION AND INTELLECTUAL PROPERTY

This lecture introduces the Master students to a selection of important current issues in the economics of intellectual property (IP). After the introduction to the current situation of the IP world and firms' IP strategies, it reviews important economic contributions to topics such as: standard setting organization-licensing - litigation - weak patents and patent pool.

PRESS ARTICLES

- Jean-François Bonnefon, *"Do or die? Study gives crash course in driverless ethics"*, MailOnline, October 24, 2018
- Jean Tirole, *"A Nobel-winning economist's guide to taming tech monopolies"*, Quartz, June 27, 2018
- Bruno Biais, *"Sachons concilier innovation et justice"*, L'Agefi, May 3, 2018
- Jean Tirole, *"Tirole contre "la défaite de la raison""*, Le Point, May 3, 2018
- Alexandre de Cornière, *"Les idées claires"*, Portrait, March 2018
- Bruno Biais, *"La bonne nouvelle de la baisse du bitcoin"*, February 2018
- Sophie Moinas, *"The stock market is a lot like bitcoin"*, Bloomberg, February 2018


- Jean Tirole, *"La révolution numérique va t-elle détruire des emplois ?"*, Challenges, January 2018
- Jean Tirole, *"There are many reasons to be cautious about bitcoin"*, The Financial Times Limited, November 2017
- Catherine Casamatta, *"En l'état actuel, le bitcoin est de la pure spéculation"*, L'Opinion, November 2017
- Jean-François Bonnefon, *"Voitures autonomes : par quoi serez vous choqués ?"*, Libération, October 2017
- Paul Seabright, *"Les MOOCs ne peuvent se substituer à l'université traditionnelle"*, Le Monde Economie, October 2017
- Interview with Jean Tirole, *"Google et Facebook doivent être vulnérables"*, WirtschaftsWoche, September 2017
- Catherine Tucker, *"Do they companies really need all that user data"*, Harvard Business Review, September 2017
- Bruno Biais, *"La bulle bitcoin"*, L'Agefi, September 2017

POLICY PAPERS

- Bruno Biais, *"Toulouse School of Economics on Cryptocurrencies"*, June 2018,
- Marcel Boyer, *"The three legged stool of music value : hertzian siriusxm spotify"*, August 31, 2017, revised October 2018
- Marcel Boyer, *"The competitive market value of copyright in music : a digital gordian knot"*, August 31, 2017, revised October 2018

Marcel Boyer, emeritus professor in the Department of Economics at the Université de Montréal and CIRANO Fellow, was invited to testify before the House of Commons' Standing Committee on Industry, Science and Technology in Ottawa on November 28 2018, in view of its study of the *Statutory Review of the Copyright Act.*
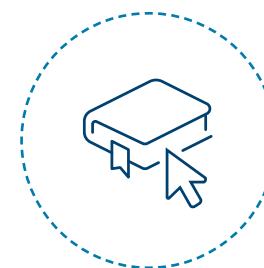
PARIS CALL
November 12 2018

The TSE-Digital Center supports the **Paris Call for Trust and Security in Cyberspace**, launched by French President Emmanuel Macron at the UNESCO Internet Governance Forum on November 12, 2018.

The Digital Center is involved in all aspects of the digital economics and is particularly concerned by security issues. The call was signed by a large number of states, private sector organizations, members of the civil society and academia.

The TSE Digital Center supports
the Paris Call for Trust and Security
in the Cyberspace

PUBLICATIONS

PUBLICATIONS

◆ Sherief Abdallah, Jean-François Bonnefon, Manuel Cebrian, Jacob W. Crandall, Fatimah Ishowo-Oloko, Mayada Oudah, Iyad Rahwan, Azim Shariff and Tennom, *"Cooperating with Machines"*, Nature Communications, vol. 9, n°233, 2018.

◆ Doh-Shin Jeon and Yassine Lefouili, *"Cross-Licensing and Competition"*, The RAND Journal of Economics, 2018, vol. 49, n. 3, 2018, pp. 656–671.

◆ Bruno Jullien and Yassine Lefouili, *"Horizontal Mergers and Innovation"*, Journal of Competition Law and Economics, 2018.

◆ Edmond Awad, Sohan Dsouza, Richard Kim, Jonathan Schulz, Joseph Henrich, Azim Shariff, Jean-François Bonnefon, and Iyad Rahwan: *"The Moral Machine experiment"*, Nature, October 24, 2018.

◆ Bruno Jullien, Markus Reisinger and Patrick Rey, *"Vertical Foreclosure and Multi-Segment Competition"*, Economics Letters Elsevier, vol. 169, August 2018, pp. 31–34.

◆ Andrew Rhodes and Chris Wilson, *"False Advertising"*, The RAND Journal of Economics, vol. 49, n. 2, Summer 2018, pp. 348–369.

◆ Marc Bourreau and Bruno Jullien, *"Mergers, investments and demand expansion"*, Economics Letters, Elsevier, vol. 167, June 2018, pp. 136–141.

◆ Bruno Jullien and Wilfried Sand-Zantman, *"Internet Regulation, Two-Sided Pricing, and Sponsored Data"*, International Journal of Industrial Organization, vol. 58, May 2018, pp. 31–62.

◆ Jay Pil Choi, Doh-Shin Jeon and Byung-Cheol Kim, *"Net neutrality, Network capacity and Innovation at the Edges"*, The Journal of Industrial Economics, vol. 66, n. 1, March 2018, pp. 172–204.

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