Catherine Bobtcheff & Carole Haritchabalet
on biobanks

Céline Bonnet & Zohra Bouamra-Mechemache
on taxing meat

Bruno Biais on
derivative contracts
and financial risks

Philippe Wahl
on regulating the
digital economy

DECIPHERING
THE WORLD
Editors’ message

Deciphering the world

Galileo stated that “nature is written in mathematical language”. This might be an ethnocentric view, but mathematics for sure plays a major role in helping us to predict the world, and its practical applications have never been more important. As we embrace this digital age, we are more and more submerged in data and knowledge, increasingly reliant on artificial intelligence and algorithms to monitor and understand trends and behaviours. Math is all around us.

TSE has a long history of high-level research in mathematics, and the special relationship between our in-house economists and mathematicians remains very strong today. The first recruits of our institution were mathematicians: one of them, Jean-Pierre Florens, is still active in Toulouse and we are proud to feature an interview with him in this special edition of the TSE Mag dedicated to the work of our very active mathematics department.

Inside the focus you will find interviews with several TSE researchers working on mathematical problems with far-reaching implications for the use of algorithms, big data, artificial and collective intelligence, optimization and machine learning.

Further on in this issue, we also feature a celebratory focus on the 25th anniversary of our research partnership with La Poste, via an exclusive interview with Chairman & CEO Philippe Wahl on the digital transformation of the company and the importance of regulating the internet, as well as the latest research results and news from TSE.

At this time of the year TSE organizes in Toulouse a wealth of academic events bringing our faculty together with renowned international peers in key areas. We also hold in Paris our outreach forums with practitioners: this year focusing on the impact of big data at the June Digital Forum, and on the management of renewables at the September Energy & Climate Forum. These events are open to all our readers, and we hope to see you there to better our understanding of the challenges that face our economies and societies, both today and tomorrow.

We wish you a pleasant read,

Christian Gollier, TSE Director
Jean Tirole, TSE Chairman
Jean-François Bonnefon on morality and machines

The TSE-CNRS-CRM-IAS T researcher discussed the ethics of self-driving cars at the Quai des Savoirs in Toulouse in February.

Catherine Bobtcheff awarded prize

Catherine Bobtcheff has been named the best young researcher in Finance and Insurance by the SCOR Corporate Foundation for Science during the 11th International Forum on Financial Risks in March.

ERC Advanced Grant awarded to Ingela Alger

Congratulations to Ingela Alger, who has been awarded an Advanced Grant by the European Research Council for her research project “Evolving Economics – Human motivation: evolutionary foundations and their implications for economics.” TSE consolidates its position as the second-largest European beneficiary of ERC grants.

Jérôme Renault introduces game theory to Meteo France

The TSE-UTC researcher discussed the best game-theory strategies and their implications at Meteo France, for a series of scientific events called the “Découvrades.”

Nour Meddahi elected to the Econometric Society

Nour Meddahi (TSE-UTC) has been elected member of the Regional Standing Committee of the Econometric Society, one of the most prestigious societies in the field of economics.

Jacques Crémer appointed Special Adviser by European Commission

The European Commission has named TSE’s Jacques Crémer as one of three special advisers to Commissioner for Competition Margrethe Vestager until March 2019, focusing on the challenges of digitization for competition policy.

Sébastien Gadat appointed to the Institut Universitaire de France

The Institute distinguishes each year a small number of university professors for their research excellence. Only 2% of French university professors have been nominated by the Institute.

Google self-driving car

The TSE-CNRS-CRM-IAS T researcher discussed the ethics of self-driving cars at the Quai des Savoirs in Toulouse in February.

Queensland exchange program

TSE and the University of Toulouse Capitole are delighted to announce they have signed a new collaboration with the University of Queensland, Australia. This new agreement will allow students to join in semester or year-long exchanges in economics from 2019 onwards.

TSE water-saving project backed by the Occitanie region

The Occitan administrative region has financed the C4EAU project on the use of smart water meters in agriculture. The project is led at TSE by Arnaud Reynaud (TSE-INRA), Sylvain Chabé-Ferret (TSE-INRA) and Stéphane Cézera (TSE-INRA) with researchers from Montpellier’s CEEM and has the objective to test the use of innovative smart meters for water use in agriculture. Over the next two years, the researchers will in particular test nudges based on real-time consumption data to optimize water use. They will also try to understand why some farmers refuse to have these new meters installed and how they could be convinced to change their mind. It is estimated that a 10% gain of water is possible through using these new technologies.

Appointments & prizes

Fighting Terrorism at Source

This book written by Jean-Paul Azam and Véronique Thelen offers a unique and insightful evaluation of the policies used to fight transnational terrorism between 1990 and 2014. It uses game theory and structural econometrics to analyze the roles of foreign aid, educational capital, and military intervention. The authors show that US troops on the ground in foreign countries increase significantly the supply of terrorist attacks from the host countries.

Jean-Jacques Laffont Prize Conference

12 OCTOBER 2018

TSE Energy & Climate Forum Paris

12 OCTOBER 2018

Jean-Jacques Laffont Prize Conference Toulouse

Save the date
What are biobanks worth?

By facilitating access to valuable biological samples, the growth of biobanks since the late 1990s has facilitated major advances in genetics and medical research. How can we ensure the economic viability of biobanks to encourage innovation? New research by TSE’s Catherine Bobtcheff and Carole Haritchabalet underlines the importance of a biobank’s strategic positioning in the marketplace, expertise and conditions of exchange. They identify information asymmetries between biobanks and research units, and suggest ways to resolve them.

The success of innovation is highly dependent on the quality of the samples and on the degree of involvement of the various stakeholders in the sample production chain. The success of innovation is highly dependent on the quality of the samples and on the degree of involvement of the various stakeholders in the sample production chain. The success of innovation is highly dependent on the quality of the samples and on the degree of involvement of the various stakeholders in the sample production chain. The success of innovation is highly dependent on the quality of the samples and on the degree of involvement of the various stakeholders in the sample production chain.

How can networking contribute to the success of innovation? Pooling several biobanks in a network reduces operating costs, increases the supply of samples, limits competition and improves the bargaining power of biobanks. It may, however, require biobanks to surrender a degree of ownership, specificity and reputation. Additional costs are linked to information asymmetries. Networking can only be successful if all partners contribute. The dilution of the responsibility of each biobank in the network leads to a free-rider problem, especially for specialist biobanks, as each biobank can benefit from the work and expertise of the others.

The positive effects of networking are more important for generalist biobanks. Increased visibility allows them to participate in more projects. Collaborations with specialist biobanks also enable generalist biobanks to increase their expertise, which in the long term has a positive effect on the quality of innovation.

In addition to providing incentive compensation for various stakeholders, biobanks must take strategic decisions about the size of their collections and the quality of their samples. In addition to providing incentive compensation for various stakeholders, biobanks must take strategic decisions about the size of their collections and the quality of their samples. In addition to providing incentive compensation for various stakeholders, biobanks must take strategic decisions about the size of their collections and the quality of their samples. In addition to providing incentive compensation for various stakeholders, biobanks must take strategic decisions about the size of their collections and the quality of their samples.

Catherine Bobtcheff
TSE-Pau University

Carole Haritchabalet
TSE-CNRS
Where’s the beef?

Food decisions can be crucial not only for our own bodies, but also for the health of the planet. Unfortunately for policymakers, consumer diets have so far proved fairly resistant to public information campaigns. Most economists instead recommend taxes as the most efficient tool for reducing the footprint of our supermarket shopping lists. In a new study featured in *The New York Times*’ earlier this year, TSE researchers Céline Bonnet, Zohra Bouamra-Mechemache and Tifenn Corre suggest that the best strategy is to focus carbon taxes on beef.

After the energy sector, agriculture is the industry with the greatest impact on the environment. In 2010, agriculture, forestry and other land use accounted for 24% of greenhouse gas (GHG) emissions. As well as climate change, the agricultural sector is also a significant contributor to problems of eutrophication, biodiversity, deforestation, land use, water use, and toxicity. Within agriculture, beef and dairy cattle are major polluters, producing almost two-thirds of global livestock emissions.

Despite the health and environmental benefits of eating less meat, current trends suggest that global meat consumption will increase by 72% between 2000 and 2030, according to the World Health Organization. Meat consumption is also expected to continue to rise in Europe, with a decrease in the share of red meat in favor of white meat.

To meet European Union targets, GHG emissions must be reduced by 20% by 2020, and by 60% by 2050, and the recommended carbon price is €56 per ton for 2020 and €200 per ton for 2050. The Toulouse researchers use these carbon prices to simulate the impact of a carbon tax on the consumption of animal products.

In their paper, the researchers analyze the impact of environmental price policies that specifically target the consumption of animal products. Most studies on consumer demand for animal products use data aggregated at the country or regional level, but the TSE study uses a dataset with uniquely detailed information on food purchases by individual French households.

"The idea of taxing the consumption of animal products to guide household decision-making is not new. However, the efficiency of such taxes has not yet been fully investigated," say the researchers.

A change in the price of animal products leads to a very small change in GHG emissions. A high tax (€200 per ton of CO₂-equivalent emissions), would lead to a 4% decrease in GHG emissions embodied in all considered food products, and up to a 6% decrease in acidification. Both tax levels would fail to meet the EU target of a 20% reduction in GHG emissions by 2050.

"We find that the GHG impacts are much smaller than those identified in the previous literature based on more aggregated data," says the researchers. "The reason is that the demand for animal products is less elastic at the aggregated level than suggested by previous studies."

Find out more

"An environmental tax towards more sustainable food: empirical evidence of the consumption of animal products in France" by Céline Bonnet, Zohra Bouamra-Mechemache, and Tifenn Corre was published in Ecological Economics in May.
Risk-sharing or risk-taking?

Can risk-sharing via derivatives perversely lead to risk-taking by financial institutions? As part of his “Trading and Post Trading” project, which was awarded a senior European Research Council grant in 2012, TSE’s Bruno Biais has published a paper in “The Journal of Finance” which shows how margin deposits and clearing arrangements can be designed to mitigate risk. Together with Florian Heider and Marie Hoerova, his co-authors from the European Central Bank, he also provides new empirical predictions about the extent and risks of derivatives activity.

Why have derivatives drawn the attention of policymakers and researchers?

Derivatives activity has grown strongly over the past 15 years. For example, the face value of credit default swaps (CDS), which are bilateral over-the-counter contracts used to insure credit risk, increased from around $180 billion in 1996 to more than $60 trillion by mid-2008.

Market value of exchanged derivatives

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<tr>
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Source: Bank for International Settlements - OTC derivatives statistics

Since financial institutions’ activities are opaque and complex, risk-taking is difficult for outsiders to detect. This creates a moral-hazard problem for protection sellers but the insurance provided by derivatives is effective only if counterparties can honor their contractual obligations. When Lehman Brothers filed for bankruptcy, it froze the positions of more than 900,000 derivative contracts (about 5% of all derivative transactions globally).

How do you simulate the tensions involved in these complex financial arrangements?

Our model features risk-averse protection buyers who want to insure against a common exposure to risk. These buyers contact protection sellers whose assets can be risky, but who are not directly exposed to the risk that the buyers want to insure. The sellers can prevent downside risk, maintaining sufficient value for their assets, by incurring costly effort such as scrutiny of potential investments. Alternatively, sellers can “shirk” the cost of scrutiny by relying on external, ready-made credit ratings or simple backward-looking measures of risk. Failure by sellers to exert risk-prevention effort (which we call “risk-taking”) leads to counterparty risk for protection buyers. Since financial institutions’ activities are opaque and complex, risk-taking is difficult for outsiders to detect. This creates a moral-hazard problem for sellers, the key friction in our model.

Why does this risk-sharing breed moral-hazard?

One of our key insights is that a large derivative exposure undermines a protection seller’s incentives to exert the risk-prevention effort when new information makes the derivative position an expected liability. In that case, the seller bears the full cost of the risk-prevention effort while the benefit of this effort partly accrues to the counterparty in the form of payments from the derivative contract.

Can derivatives generate contagion between asset classes?

With moral hazard, bad news about protection-buyer assets can increase the likelihood of low pay-offs from protection-seller assets, because bad news undermines sellers’ risk-prevention incentives. For example, before the recent crisis banks frequently reduced their capital requirements by purchasing derivatives. Our model predicts that financial institutions with larger short CDS positions exposed their balance sheets more to downside risks as bad news about the housing market emerged. Importantly, this exposure is a calculated choice, not the consequence of mistakes or incompetence.

How can we create safer financial markets?

The main focus of our paper is to characterize the optimal design of margin calls and central clearing platforms (CCPs). These institutional arrangements aim to mitigate counterparty risk and were adopted by both US and European regulators following the 2008 financial crisis. Our model features a CCP that pools the resources from all protection sellers. Any losses from the default of individual sellers are therefore shared across all buyers.

ERCC Support

This research has received financial support from the European Research Council under the European Community Seventh Framework Program FP7/2007-2013 grant agreement N_295484 - TAP.
DECIPHERING THE WORLD

14 Sébastien Gadat on machine learning
16 Jean-Pierre Florens on the power of mathematics
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20 Adrien Blanchet on interdisciplinarity at TSE
21 Eve Leconte on censored duration data
22 Stéphane Villeneuve on algorithms
We have worked with Airbus to use these sequential decision-making algorithms to define an optimal flight path and therefore working out the journey which consumes the least fuel. Since my arrival, the mathematics and statistics group has expanded and progressed in various fields, and think that we are currently covering all major research trends in applied mathematics, such as Big Data, artificial intelligence, optimisation, machine learning but also the latest progress in game theory with repeated games. Scientific emulation is a real asset of TSE.

What are you working on?
I am currently working on several research topics, notably statistical learning, which is the tool behind most artificial intelligence. For example, understanding the geometry of very large graphs, which is a problem we encounter when using Big Data. Facebook is a perfect example of this type of data. If we try to represent interactions between users, we can use mathematical tools to try and understand major trends, the centres and main axes. I am also looking at problems of optimising functions, not necessarily convex, with a sequential algorithm. Our contribution is developing an approach which allows us to put the convexity framework and the deterministic measurement framework to one side to get valid results for a wide number of situations. I should also underline the exceptional groundwork done by Jérôme Bolte on this topic. This type of work can be used in sequential decision-making, machine learning and also finance.

More specifically, we have worked with Airbus to use these sequential decision-making algorithms to define an optimal flight path, considering the uncertainty of weather conditions or the consumption of extremely complex models which, if not readable by a human. This is what sets it apart from other machine learning methods, which we can understand and visualise.

Finally, I am currently working on de-convolution of the mixing law through super-resolution. The idea is to be able to sort through the laws that code these observations. This work links optimisation (particularly the notion of duality) and statistics, it’s an exciting and promising field.

What are the major trends in mathematics at the moment?
Currently sequential methods are a key concern of applied mathematics (optimisation and statistics). They allow decision making with uncertainty in real time. These issues are increasingly important due to the constant increase in the amount of data collected, notably to build algorithms which govern the digital world, this is what is known as machine learning.

Deep learning is also an ongoing issue, it is a sub-section of machine learning which involves implementing a cascade of extremely complex models which, if it provides reliable predictions, is very obscure and the final algorithm is often not readable by a human. This is what sets it apart from other machine learning methods, which we can understand and visualise.

We always need new algorithms to continue to process big data which arrives each second and which can signal very rapid changes in all measured fields.

A Facebook node, visualized

Since my arrival, the mathematics and statistics group has expanded and progressed in various fields, and think that we are currently covering all major research trends in applied mathematics, such as Big Data, artificial intelligence, optimisation, machine learning but also the latest progress in game theory with repeated games. Scientific emulation is a real asset of TSE.

What attracted you to TSE?
I joined TSE in 2014, mainly motivated by the research group’s academic ambition, which is at the forefront of the main issues in the field of mathematics, and also my desire to join an institution which gives researchers adequate resources for substantial projects. TSE is a place where things progress and work well.

We have worked with Airbus to use these sequential decision-making algorithms to define an optimal flight path and therefore working out the journey which consumes the least fuel.
Jean-Pierre Florens arrived in Toulouse in 1986 from Aix to join Jean-Jacques Laffont and Michel Moreaux and set up IDEI (later TSE) a few years later. He talks to us about his research in mathematics and econometrics, changes to the field and the history of Toulouse economists.

What is your main work?

My research work in mathematics and statistics mainly focuses on the theory of inverse problems, i.e. estimating the causes of a phenomenon from its consequences.

It’s a real pleasure to share and guide new generations of researchers and I think that’s something we do very well here.

Finally, more recently, I have looked at the theory of networks and more generally the introduction of geometric concepts for functional estimation. This covers the study of networks (e.g. social) and their geometry when they are very extensive. These are problems which we encounter when handling huge amounts of data on networks between individuals, helping us to understand behaviour which is unique to the individual and behaviour which is the product of the society in which they develop. We are starting to work on these topics with my TSE colleagues and notably Stéphane Villeneuve, Thomas Mariotti and Jérôme Bolte.

What interested you about these problems?

Above all, it was my interest in these mathematical objects which got me interested in network issues. These are complex structures and at the forefront of current research in statistics, like questions relating to Big Data or Machine Learning.

On the other hand, the pleasure of understanding and precisely defining phenomena and the resulting intellectual satisfaction are reasons for my love of mathematics. Mathematics allow unmatched reasoning where the most complex problems can be expressed and solved with a few characters.

Other than this love of mathematics, what have been some career highlights?

Being able to supervise over 50 doctoral students, most of whom are now professors at the best universities across the globe. I work regularly with about ten of them on various topics. It’s a real pleasure to share and guide new generations of researchers and I think that it is something we do very well here.

We’ve also built some strong research partnerships. I am convinced that exchanging with companies, like I have done with La Poste, Royal Mail, CNES, Telefonica, EDF and others, has given rise to new research issues. This advantage has led to Toulouse’s reputation in economics research, and it has allowed us to deliver unprecedented research results.

What was TSE like in 1986?

Everything started in 1985 when Jean-Jacques Laffont received approval for two professor positions in Toulouse, which he immediately offered to Jean-Charles Rochet and I, and we joined Toulouse in ’86 and ’87 respectively. Jean-Jacques’ entrepreneurial outlook and his vision allowed the institution to transform into an international research centre. On the one hand because he had this dream and outlook, and also because he knew to surround himself with excellent professors and to rely on French institutions to work together in an innovative manner.

I kind of miss the feeling of that era and the opportunities we had, everything seemed possible and our small team gave us flexibility which we have lost by getting bigger. However, our current size has given us a lot of flexibility in many other fields, such as recruitment and hosting prestigious visitors, and we have developed extraordinary scientific activities which are unrivalled worldwide.

Jean-Pierre Florens

The pleasure of understanding

Exchanging with companies has given rise to new research issues. This advantage has led to Toulouse’s reputation in economics research, and it has allowed us to deliver unprecedented research results.
Margins of error and Big Data

Anne Ruiz-Gazen arrived at the University of Toulouse Capitole in 1993 and works with the TSE decision mathematics group, focusing on margins of error. She talks to TSE Mag about a number of challenges in the field, as TSE prepares to welcome the useR! conference in July 2019, dedicated to the R statistical and data science software environment.

Anne Ruiz-Gazen works on statistical methodologies, in particular on understanding and improving margins of error. "My mathematical work can be applied to numerous fields, such as socio-economic surveys, or in industry, for detecting anomalies," she explains.

Illustration of the major risks of a bad sample: not considering a part of the population either because of bad selection or because of non-responding individuals.

Margins of error

For example, to assist major national bodies such as INSEE (the French national institute for statistics and economic studies), INED (national institute for demographic studies) or INSERM (national institute of health and medical research) when they carry out national surveys. Anne Ruiz-Gazen works on improving and understanding the reliability of these types of surveys. "We recently collaborated with INED on a major survey connected with tracking individuals from birth to the age of twenty. We calculated the reliability of their results on the basis of their sampling methods." Her research showed that the chosen protocol was not optimal and had increased the survey’s margin of error. "The survey uses the same child birth dates for all the deliveries sampled, which increases uncertainty, because this choice potentially reduces variability within the sample."

She also works on electoral polling, and particularly on spatiality of the data. "For the last French Departmental elections, we work with Christine Thomas (TSE - UTC), Thibault Laurent (TSE - UTC) and An Huong Nguyen (doctoral student – TSE – UTC) on prediction models that take the specific nature of this type of data, known as composition data, into consideration; we also look at geographic location, so as to anticipate the effects of an economic or demographic change on the results."

"Clean" data

With the aim of improving data, Anne Ruiz-Gazen works with Dr Aurore Archimbaud of TSE on ways to detect anomalies using applications in industry. "With the exponential increase in the number of measurements taken using electronic components, there are problems of scale when searching for anomalies. The results of this work have since been used by several companies to reduce manufacturing flaws."

Anne Ruiz-Gazen

TSE-UTC

We are proud to organise useR! at TSE

Most economists and statisticians agree in saying that the arrival of Big Data - the exponential growth in quantities of data available for processing - represents a major development for society in years to come. "There is no doubt that Big Data is the future, but one of the often-forgotten challenges of this revolution is the reliability of the data published. Improving the accuracy of estimates combining survey data with huge volumes of data is a difficult topic with plenty to consider."

useR! 2019

This annual conference dedicated to the R free software was first held in 2004, and since 2006 has alternated between European and US cities. After Rennes in 2009, Toulouse will be the second French city to host the event, which brings together over 1000 researchers and economic decisions makers to consider the latest developments in the software. "We are proud to organise useR! at TSE, in partnership with Paul Sabatier University and the INRA (French National Institute for Agricultural Research); it is excellent news for all the companies and scientists who use this tool, a touchstone in the field."

Illustration of the major risks of a bad sample: not considering a part of the population either because of bad selection or because of non-responding individuals.

Find out more on useR! 2019 on the official website: www.user2019.fr
ADRIEN BLANCHET ON INTERDISCIPLINARITY AT TSE

The universality of mathematics

Adrien Blanchet (TSE/IAST-UTC), who arrived in Toulouse from Cambridge University in 2008, is working on numerous projects associated with mathematical analysis. Fascinated by interactions between mathematics and other scientific disciplines, he tells us why interdisciplinarity is fundamental to his research.

What convinced you to join TSE?
When I arrived in 2008, I chose Toulouse above all to join an excellent research group working on applied mathematics and for the opportunity to explore interactions with Toulouse economists. It took part in seminars, particularly on theoretical economics, and held discussions with many colleagues, which enabled me to use my own expertise to respond to various economic questions and develop new research avenues at the crossroads between our disciplines. For instance, I worked on Beckmann-type models for the transport of goods and services within this field, Adrien Blanchet (TSE/IAST-UTC), who arrived in Toulouse from Cambridge University in 2008, is working on numerous projects associated with mathematical analysis. Fascinated by interactions between mathematics and other scientific disciplines, he tells us why interdisciplinarity is fundamental to his research.

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An emergent property is a property of the system’s components, but of the system as a whole. This idea featured in the work of the first economists like Paul Samuelson and Jan Tinbergen and has been conducted ourselves at TSE. I have, for instance, been working for several years with biologist Guy Theraulaz (CRCA) and physicist Clément Sire (LPT) on the emergence of a population of multicellular organisms from single-celled organisms. For several years, I have been conducting a general exploration of emergent properties in various applications.

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What does interdisciplinarity mean for your work?
Interdisciplinarity is fundamental to my way of conducting research. It means combining approaches that are not usually used together and, above all, learning and questioning. The Institute for Advanced Study in Toulouse is an important asset in this context. Discoveries from research into social sciences and biology always raise new questions and exciting avenues for investigation. These interactions are extremely precious to me and provide a challenge that is intellectually stimulating.

EVE LECOTNE ON CENSORED DURATION DATA

The power of statistics

How long does it take female graduates to secure a job? Which combination of genes best predicts the survival of cancer patients? What impact do socio-economic and geographical characteristics have on regional elections? Finding answers to such diverse questions and providing their students with the powerful tools of statistical analysis are key challenges for Eve Leconte and other members of TSE’s expert group on the mathematics of decision-making and statistics (MADS).

Eve’s research areas are the set of statistical methods for data which correspond to durations – such as lifetimes, or periods of unemployment or marriage – and are often censored. Censored data are among the complex data structures in which only partial information on the variables of interest is available. Censoring occurs when the event of interest – such as death, finding a job or divorce – does not happen during the follow-up time for some individuals. Statistical analysis can provide more accurate estimates of cancer patients’ survival duration which are extremely useful to adapt treatments to each patient. Within this field, Eve works on competing risks. These scenarios occur when an individual is at risk of several types of events, as is the case for cancer patients in the post-therapeutic phase. She is also interested in variable selection in survival models in high dimension, which is particularly relevant to oncology. Since the sequencing of the genome, a colossal amount of genetic information is now available to clinicians. Statistical analysis can establish which combination of genes best predicts the survival of cancer patients, providing more accurate estimates of survival duration. This information can be extremely useful in adapting treatment to the needs of the patient. The goal of MADS is to animate and develop research activities in mathematics applied to economics. The goal is to animate and develop research activities in mathematics applied to economics. Topics include operations research, the mathematics of finance, statistics, econometrics, game theory, optimization, calculus of variations and PDE, mathematical models in economics, finance, and social sciences. One example of the MADS group’s application of statistical methodology to economic data is Eve’s joint project with Sandrine Casanova. This research aims to model the cumulative distribution function of a censored duration in the context of survey sampling, in a finite population or in domains which may be small. The estimators they propose are based on nonparametric quantile regression adapted to the censored case. This work has, among other things, made it possible to estimate the distribution of access times to their First job for female graduates in the Occitania region, depending on their education type and level. In another project for the MADS team, Christine Thomas-Agnan, Thibault Laurent and Anne Ruiz-Gazen are working with PhD student Nguyen Huy An on the modelling of data from French departmental elections, taking into account some socio-economic and geographical characteristics. This requires specific statistical methodology and the researchers aim to provide new regression estimators in this context. More information on this project can be found on page 18.
Stéphane Villeneuve joined TSE in 2002 from the Université d’Evry and works on the problem of a rigorous formulation of the principal-agent model in dynamic models. He works to offer quantitative decision-making tools and describes his work as a real toolbox for economists.

Stéphane Villeneuve was working in mathematical finance when he met Jean-Paul Dekamps, Thomas Mariotti and Jean-Charles Rochet, who convinced him to join TSE: “they showed me that there were great mathematical problems in industrial economics”, he explains. “Industrial economics systematically considers the friction inherent in the real world, whilst mathematical finance is based on a theoretical perfect market.”

The Toulouse economists notably study friction due to information asymmetry and moral hazards, or moral risks, for example when an insurer cannot verify prevention put in place by the insured party. “I study principal-agent type dynamic problems in a quantitative manner. This quantitative approach links probability, control theory and optimisation and looks to describe contracts explicitly or in a digital manner.” These questions cover various fields: insurance, portfolio management and investment decisions.

Bonus-malus system for managers

The researcher has worked with quantitative tools on issues including paying managers and refinancing companies: “with regards to manager payment, our results confirm that a bonus-malus approach is best. The idea is to block manager payment in an escrow account which develops in line with performance. The manager receives payment only after a long period of success has been observed. Inversely, their area of action is reduced after poor results to limit losses linked to the manager’s decisions.” For company refinancing, Stéphane and his co-authors demonstrate that they each have a cash reserve threshold when it is in their interest to pay dividends to shareholders. This cash reserve buffer level helps avoid the use of the costly refinancing market when new investment opportunities arise. Stéphane has worked with EDF R&D to build investment policy management tools “EDF wanted to understand how improved management of their liquid asset reserve could help them to finance their huge nuclear investments.”

Obscure algorithms

The dynamic and quantitative approach to industrial economics by Stéphane has a major advantage: it allows the analytical characterisation of optimal contracts through partial differential equations which require digital approaches when the model becomes complex. Stéphane wants digital methods used in economics and finance to become more transparent: “many authors do not provide the code or even a description of the algorithm which allows them to obtain their digital results, therefore making their work unclear. The researcher would like a greater number of reviews to verify digital methods used to prevent approximation or simulation errors. He notes progress, however, “some reviews have started to require an accurate description of digital methods and the provision of calculation codes before publishing research articles, it’s a good start.”
How has the postal sector changed since the La Poste-TSE partnership began?
Over the past 25 years, the postal sector has been shaken by two major revolutions. First, the complete opening of the European postal market to competition, initiated at the same time as our partnership with TSE in the early 1990s. This spring, the 10th Postal Economics Conference on E-commerce, Digital Economy and Delivery Services coincided with the 25-year anniversary of La Poste’s research partnership with TSE. As Groupe La Poste prepares to take on new roles and responsibilities in the digital era, Chairman and CEO Philippe Wahl discusses the role of economic analysis in helping both businesses and society to adapt.

Economists’ analysis of competitive practices and the structure of data-driven markets in the digital economy is essential to adapt competition rules to the new ecosystem
Second, and probably the most important, was the digital revolution that hit postal operators with the dematerialization of correspondence between individuals, professionals, the state and its citizens. Between 2008 and 2017, we went from 18 billion to 11 billion addressed mail items. Our traditional role is progressively disappearing. This is an invitation to conduct an in-depth analysis of our business model, and the viability and utility of our services of general economic interest (SGEI), focused on the delivery of mail and print media, in more than five centuries, focusing on social connections or the externalities it generates for related commercial activities. Once the SGEI have been properly defined to meet the needs of users, the operators responsible for these SGEI must be compensated for the additional costs. At the beginning of the 2000s, economists defined the most relevant method of calculating these net costs, corresponding to the difference in profits made with and without the public service role. This calculation involves a scenario that is expected to remain theoretical, in which the operator is relieved of its obligations. Mobilizing economic analysis to build these counterfactual scenarios can only make them more credible and robust, and less susceptible to challenge before the competition authorities and the European Commission.

What other issues will be the focus of future partnership research?
Economists’ analysis of competitive practices and the structure of data-driven markets in the digital economy, characterized by the presence of network externalities that inevitably lead to the creation of dominant positions, is essential to adapt competition rules to the new ecosystem. Issues relating to the dominance of certain players, competitive distortions based on tax optimization strategies, the exploitation of collaborative work, personal data, etc., must be at the heart of the debate. These projects, and many others, will mobilize the teams of economists in Toulouse and at the heart of the French Post in order to build the theoretical, in which the operator is relieved of its obligations. Mobilizing economic analysis to build these counterfactual scenarios can only make them more credible and robust, and less susceptible to challenge before the competition authorities and the European Commission. Criticisms might, as in the past, denounce La Poste’s diversification strategy, accusing it of relying on its SGEI and its dominant position in the mail market to expand into new business sectors. But can we compare a company in a dominant position in a growing market? What power does one derive from being not the only company in a market, but the last? What power do we derive from a dominant position in an intermediate market, providing an input (I am thinking here of parcel delivery) to economic players with quasi-monopsony power?

Is La Poste prepared for the digital era?
In the face of adversity, La Poste has always been able to reinvent itself while preserving its core identity: to be a local actor, prioritizing the interest of its users, guarantor of the SGEI that the state has entrusted to it. To this end, La Poste has begun its most complex transformation in more than five centuries, focusing on diversification. Since 2006, we have developed our financial activities by creating a common financial activities by creating a common

TSE and La Poste teams meet in May for the anniversary conference
A partnership that delivers

When the partnership between La Poste and TSE started, the debate about opening up the postal sector to competition was in full swing. As one of the TSE researchers invited to analyze the optimal structure of the postal market, Catherine Cazals says that La Poste’s data was instrumental in the production of pioneering research.

To begin with, it was essential to acquire a thorough understanding of the economic characteristics of the postal sector. Among these characteristics, the cost function of the postal service initiated a quarter century of applied econometric work under the leadership of Jean-Pierre Florens at TSE. One of the main objectives was to better understand the cost drivers and to quantify potential economies of scale.

These 25 years of econometric analysis have only been made possible by La Poste’s continued efforts to provide us with databases of great richness. La Poste gave us access to an incredibly rich database: “Statistics 74.2”. This contained information broken down to the level of the delivery rounds of postal workers in more than 10,000 delivery offices. The first articles using this data demonstrated the existence of relatively large increasing returns to scale in the delivery activity. “Statistics 74.2” was then made available as a panel, allowing us to refine our estimates and evaluate the “size” effect of delivered items on cost. Econometric work to identify the cost drivers has continued using another, more aggregated dataset of about 4,700 delivery offices and their “satellite” offices.

We also focused on an analysis of efficiency, identifying the offices delivering a given volume of mail at the lowest cost, then measuring an efficiency score with respect to this frontier. This led to the implementation of an original method for analyzing the cost of delivery. We also investigated the role of environmental features such as the size or density of a delivery office’s local area.

The network of contact points was also the subject of pioneering cost analysis. We estimated the production cost elasticities for activities carried out over the post office counter, showing that returns to scale are relatively high in smaller offices, but constant for larger offices. This analysis is currently being updated with new data for a network that has changed a great deal, notably with the transformation of post offices into an Agence Postale Communale (APC) or Relais Poste Commerçant (RPC).

This work is only a sample of all the econometric work done during these 25 years. Another theme that has given rise to many studies is that of demand, which has been treated using individual or aggregated data. Of course, these 25 years of econometric analysis have only been made possible by La Poste’s continued efforts to provide us with databases of great richness.

Platforms are fantastic and scary. Despite an avalanche of initiatives in Brussels to tackle platform phenomena, we don’t have an anti-platform reflex. Platforms have contributed to welfare immensely. But the dependency of businesses on digital platforms is growing, along with an imbalance in power and size. Transparency is part of the solution.

We want to increase predictability. Platforms must have clear terms and conditions, and give basic information about how their ranking functions. We need to ask them to reveal their algorithms or share their data, but to be crystal clear about what data they share and on what basis. If they give preference to their own services, that has to be spelled out. There must also be better mechanisms for resolving complaints. Delisting can be deadly to businesses, so there is an obvious need for regulation because of the market power of these platforms. Thanks to Jean Tirole and TSE, we are working on that key question: what is the best regulation for the common good? Digital platforms give us a lot of convenience. But what is the price of these services, in terms of freedom and sharing intimacy? Is there voluntary servitude in the digital world?

Amazon is our number one client, and it’s becoming our number one competitor. It has very positive impacts: the convenience for clients, the quality of service which is stimulating us to improve, and a fantastic ability to innovate. At the same time, Amazon is paying very low tax and it’s hurting fair competition. There is an obvious need for regulation. Platforms must have clear terms and conditions, and give basic information about how their ranking functions. We need to ask them to reveal their algorithms or share their data, but to be crystal clear about what data they share and on what basis. If they give preference to their own services, that has to be spelled out. There must also be better mechanisms for resolving complaints. Delisting can be deadly to businesses, so there is an obvious need for regulation because of the market power of these platforms. Thanks to Jean Tirole and TSE, we are working on that key question: what is the best regulation for the common good? Digital platforms give us a lot of convenience. But what is the price of these services, in terms of freedom and sharing intimacy? Is there voluntary servitude in the digital world?

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For more information on the event, please contact:
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You can share your internship and job offers with our students via the platform:
alumni.tse-fr.eu

FRIDAY 23 NOVEMBER 2018
9H - 17H / TOULOUSE
MANUFACTURE DES TABACS

Jobs, companies, internships, opportunities and training: a whole day dedicated to the careers of our graduates, your future employees and collaborators.

55 COMPANIES, & YOURS?

TSE CAREERS FORUM
BUSINESS NETWORKING DAY
In the past 15 years the digital economy has significantly affected market organization and the supply and demand of different economic players. The historical flagship TSE “EMO” course has integrated these changes into its program, and our future economists benefit from the TSE faculty experts’ latest insights into today’s industrial and digital economy.

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For several years, the rapid development of digital tools and standards has continued to impact the operation of all economic sectors, either by affecting consumer behavior or competition between companies, as they seize new opportunities or as innovative companies enter their market. In this context, it is vital for future TSE economists to consider the consequences of this digital revolution.

Most of today’s digital giant companies including the GAFA [Google, Apple, Facebook, Amazon] are platforms.

Understanding how markets work, the strategic decisions made by companies, the structure of demand, costs, and the link between market structure and company behavior are essential concepts taught in the EMO master’s degree. At the end of the course, students are able to model interactions between companies within a market, identify the key factors of their operations, carry out a quantitative analysis to assess effectiveness, ascertain competition and regulatory policy tools as well as assess the impact of such tools, if implemented.

As emphasized by Doh-Shin Jeon, TSE professor specialized in digital competition and market strategies, “most of today’s digital giant companies including the GAFA [Google, Apple, Facebook, Amazon] are platforms.” Given the importance of digitalization, the EMO program directors have chosen to dedicate an entire course to the digital economy from next term. The theoretical aspects of this course will be supervised by Yassine Lefouili, while Daniel Ershov will focus on the empirical perspective.

In addition to many other topics essential to digital economics (such as mergers, collusion, exclusion or tied selling), platforms are studied with classic industrial organization theory in mind, as well as the concept of two-sided markets. Developed by TSE researchers around 15 years ago, the two-sided market model has struck a chord with both the scientific community and companies, and is regularly referred to by management researchers and economists. This conceptual framework is taught from scratch so that students can analyze industrial economy questions from this angle, where relevant.

To better understand how competition in platform markets works, the EMO course looks for example at the compatibility of certain systems or technologies. What competition and regulatory tools need to be implemented to deal with digital players (e.g. Apple, Microsoft…) wanting to keep their advantage by not making their system compatible with their rivals?

As Daniel Ershov tells us, “the media tends to exaggerate certain aspects of e-commerce and the internet while ignoring other key features, which is why it is important to analyze these matters using economic models.” Students will be able to understand the inner workings of the digital revolution, in terms of what it is changing but also what remains unchanged.

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TSE ENERGY & CLIMATE FORUM

AXA FRANCE,
23 AVENUE DE MATIGNON, 75008 PARIS
8H30 - 13H30

Register on tse-fr.eu/forum