



THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

Abstract Book

**15th Annual International Conference on
Mathematics: Teaching, Theory &
Applications
28-30 June & 1 July 2021, Athens, Greece**

Edited by
Gregory T. Papanikos

2021

Abstracts
15th Annual International
Conference on Mathematics:
Teaching, Theory &
Applications
28-30 June & 1 July 2021
Athens, Greece

Edited by Gregory T. Papanikos

First published in Athens, Greece by the Athens Institute for Education and
Research.

ISBN: 978-960-598-426-7

All rights reserved. No part of this publication may be reproduced, stored,
retrieved system, or transmitted, in any form or by any means, without the
written permission of the publisher, nor be otherwise circulated in any form of
binding or cover.

8 Valaoritou Street
Kolonaki, 10671 Athens, Greece
www.atiner.gr

©Copyright 2021 by the Athens Institute for Education and Research. The
individual essays remain the intellectual properties of the contributors.

TABLE OF CONTENTS

(In Alphabetical Order by Author's Family Name)

Preface		9
Organizing & Scientific Committee		10
Conference Program		11
1.	Accounting for Multilayered Unobserved Heterogeneity in Bivariate Probit Modeling with the Grouped Random Parameters Bivariate Probit Model with Heterogeneity in Means <i>Sheikh Shahriar Ahmed, Sarvani Sonduru Pantangi, Ugur Eker, Grigorios Fountas, Stephen Still & Panagiotis Anastasopoulos</i>	15
2.	Productivist Agricultural Systems to Multifunctional Agriculture in the Cocoa Agrarian System, in Bahia, Brazil <i>Gustavo Bittencourt Machado</i>	17
3.	Practice the Purpose Preach: Experimental Evidence on the Effect of Corporate Purpose on Workers Willingness to Go the Extra Mile <i>Nikolai Brosch</i>	19
4.	Unemployment Insurance, Learning and Worker Profiling <i>Sergio Cappellini</i>	19
5.	Action Research of the Influence of Class Group Division Teaching on the Mathematical Learning Motivation and Achievements of Junior High School Low-Achievers <i>Erh-Tsung Chin, Shih Yu Yang & Hui-Ling Lee</i>	20
6.	Price Markups: The Invisible Hand in your Pocket <i>Constantin Colonescu</i>	22
7.	The Macroeconomics and the Construction Sector: Evidence from Portugal <i>Leonida Correia</i>	23
8.	The Convergence Trajectories of European Minimum Wages: From 'Antiquated Anti-Poverty Tool' to Indicator of Changing Power Structures in Industrial Relations? <i>Joshua Cova</i>	24
9.	Why Corporate Governance cannot be Improved Easily: A Behavioural Perspective <i>Lazar Djurovic & Miroslav Todorovic</i>	25
10.	The Influence of Personality Traits of Millennials on the Buying Behaviour during the COVID-19 Pandemic - A Comparative Study between South Africa and Germany <i>Thomas Dobbstein & Vannie Naidoo</i>	26
11.	The FDI Home Country Impact on the Productivity of the Hosts <i>Viktar Dudzich</i>	28
12.	Economic Specialization, its Changes and Impact on Regional Economic Development in the European Union <i>Giedre Dzemydaite</i>	30

13.	Reflections on Macroprudential Reverse Stress-Testing <i>Jerome Henry</i>	31
14.	The Change of Participants' Mathematics Knowledge for Teaching in a Primary School Teacher Professional Learning Community <i>Ya-Lan Huang & Erh-Tsung Chin</i>	32
15.	Strategic Marketing Planning in Brand Building of Arts and Cultural Institutions <i>Radmila Janicic</i>	33
16.	SmartBrands: The Story of Purpose and Mindful Branding in a Digital World <i>Stavroula Kalogeras</i>	35
17.	Brand Building in Higher Education: A Grounded Theory Investigation of the Impact of "Positive Visualisation Courses upon Brand Identity" <i>Marilia (Maria) Kountouridou</i>	36
18.	A Partial Nonlinear Extension of Lax-Richtmyer Approximation Theory <i>Aradhana Kumari</i>	37
19.	Teaching University Gen Z Business Students in Synchronous Online Professional Business Courses <i>Laura Lambdin</i>	38
20.	The Role of Social Exclusion and Vulnerability: An Approach before the COVID-19 Pandemic in Spain <i>Paloma Lanza-Leon, Marta Pascual-Saez & David Cantarero-Prieto</i>	40
21.	Regulatory Environment and Capital Structure in Private Firms of the EU <i>Jose Lopez-Gracia, Alejandro Casino-Martinez & Reyes Mestre-Barbera</i>	42
22.	Assessing the Effects of Health Claim Regulations on Food Demand <i>Stavroula Malla, K.K.Klein & Taryn Presseau</i>	43
23.	Business Cycle in an Oligopolistic Economy with Entry and Exit <i>Marco Mazzoli</i>	44
24.	A Diagnostic Test Based on a Mixture of Gaussian Copula Model <i>Ampalavanar Nanthakumar</i>	45
25.	Regional Water Transfer and Economic Growth: A Synthetic Control Analysis <i>Arpita Nehra</i>	46
26.	Poverty Alleviation in China: An Example of Jiangxi Province <i>Samaneh Raiss Shaghaghi</i>	47
27.	Security Bubble Over <i>Stephane Fotis Roume</i>	48
28.	The Impact of Network Cycles on Employment and Inequality <i>Sofia Ruiz-Palazuelos</i>	50

29.	Towards Generating Real-World Datasets for Teaching Statistics in Industrial Engineering <i>Farida Said, Iehann Eveno & Jeanne Villaneau</i>	51
30.	Toxic Loans and the Rise of Populist Candidacies <i>Emilie Sartre, Gianmarco Daniele & Paul Vertier</i>	53
31.	To Beef or not to Beef: Trade, Meat, and the Environment <i>Dora Simon</i>	54
32.	An Alternative Approach to Difference Equations by Evolution Cocycles <i>Codruta Stoica</i>	55
33.	3-Triangulations of p-Toroids <i>Milica Stojanović</i>	56
34.	Working Capital Management Research in South Africa during the COVID-19 Pandemic <i>Miemie Struwig & Storm Watson</i>	57
35.	Examining the Country-of-Origin Effect through the Lens of Evolutionary Psychology <i>Aarron Toal</i>	58
36.	Pupil's Fraction Learning Based on Board Game Playing <i>Chia-Hao Tsai & Erh-Tsung Chin</i>	60
37.	'Copula' Based Quality Control Charts in the Presence of Positive Autocorrelation <i>Tim Young & Ampalavanar Nanthakumar</i>	61
38.	Analysis on the Differences of the Main Global Epidemic Fighting Models - Based on the Deep Research of Glacial Model <i>Wanting Zhao & Zheng Fan</i>	62

Preface

This book includes the abstracts of all the papers presented at the *15th Annual International Conference on Mathematics: Teaching, Theory & Applications* (28-30 June & 1 July 2021), organized by the Athens Institute for Education and Research (ATINER).

A full conference program can be found before the relevant abstracts. In accordance with ATINER's Publication Policy, the papers presented during this conference will be considered for inclusion in one of ATINER's many publications.

The purpose of this abstract book is to provide members of ATINER and other academics around the world with a resource through which to discover colleagues and additional research relevant to their own work. This purpose is in congruence with the overall mission of the association. ATINER was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet to exchange ideas on their research and consider the future developments of their fields of study.

It is our hope that through ATINER's conferences and publications, Athens will become a place where academics and researchers from all over the world regularly meet to discuss the developments of their discipline and present their work. Since 1995, ATINER has organized more than 400 international conferences and has published nearly 200 books. Academically, the institute is organized into 6 divisions and 37 units. Each unit organizes at least one annual conference and undertakes various small and large research projects.

For each of these events, the involvement of multiple parties is crucial. I would like to thank all the participants, the members of the organizing and academic committees, and most importantly the administration staff of ATINER for putting this conference and its subsequent publications together. Specific individuals are listed on the following page.

Gregory T. Papanikos
President

**15th Annual International Conference on Mathematics:
Teaching, Theory & Applications, 28-30 June & 1 July 2021,
Athens, Greece**

Organizing & Scientific Committee

All ATINER's conferences are organized by the Academic Council. This conference has been organized with the assistance of the following academic members of ATINER, who contributed by reviewing the submitted abstracts and papers.

1. Gregory T. Papanikos, President, ATINER & Honorary Professor, University of Stirling, U.K.
2. Codruta Simona Stoica, Head, Mathematics & Statistics Unit & Professor and Vice-Rector, Aurel Vlaicu University of Arad, Romania.
3. Timothy M. Young, Director, Center for Data Science (CDS) & Professor and Graduate Director, Center for Renewable Carbon, The University of Tennessee, USA.
4. Sharon Claire Bolton, Vice President of Research, ATINER & Professor, The Management School, University of Stirling, Scotland.
5. Chris Sakellariou, Head, Economics Unit, ATINER & Associate Professor of Economics, Nanyang Technological University, Singapore.
6. Cleopatra Veloutsou, Head, Marketing Unit, ATINER & Professor of Brand Management, University of Glasgow.

FINAL CONFERENCE PROGRAM
**15th Annual International Conference on Mathematics: Teaching,
Theory & Applications, 28-30 June & 1 July 2021, Athens, Greece**

PROGRAM

Monday 28 June 2021

08.30-09.00
Registration

09.00-09.30

Opening and Welcoming Remarks:

- **Gregory T. Papanikos**, President, ATINER.
 - **Sharon Claire Bolton**, Vice President of Research, ATINER & Professor, The Management School, University of Stirling, Scotland.
 - **Timothy M. Young**, Director, Center for Data Science (CDS) & Professor and Graduate Director, The University of Tennessee, USA.
 - **Cleopatra Veloutsou**, Head, Marketing Unit, ATINER & Professor of Brand Management, University of Glasgow, UK.
 - **Codruta Simona Stoica**, Head, Mathematics & Statistics Unit, ATINER & Professor and Vice-Rector, Aurel Vlaicu University of Arad, Romania.
-

09:30-11:30

1. **Jose Lopez-Gracia**, Professor, University of Valencia, Spain.
Title: Regulatory Environment and Capital Structure in Private Firms of the EU.
 2. **Thomas Dobbelstein**, Professor Baden Württemberg Cooperative State University, Germany.
Title: The Influence of Personality Traits of Millennials on the Buying Behaviour during the COVID-19 Pandemic – A Comparative Study between South Africa and Germany.
 3. **Stephane Fotis Roume**, Assistant Lecturer, University of West Indies, France.
Title: Security Bubble Over.
 4. **Lazar Djurovic**, Teaching Assistant, University of Belgrade, Serbia.
Miroslav Todorovic, Full Professor, University of Belgrade, Serbia.
Title: Why Corporate Governance cannot be Improved Easily: A Behavioural Perspective.
 5. **Viktar Dudzich**, PhD Student, Prague University of Economics and Business, Czech Republic.
Title: The FDI Home Country Impact on the Productivity of the Hosts.
-

11:30-13:00

1. **Timothy M. Young**, Director, Center for Data Science (CDS) & Professor and Graduate Director, The University of Tennessee, USA.
Ampalavanar Nanthakumar, Professor, State University of New York at Oswego, USA.
Title: 'Copula' Based Quality Control Charts in the Presence of Positive Autocorrelation.
2. **Farida Said**, Associate Professor, LMBA Laboratory, University of South Brittany, France.
Title: Towards Generating Real-World Datasets for Teaching Statistics in Industrial Engineering.
3. **Sheikh Shahriar Ahmed**, Graduate Research Assistant University at Buffalo, The State University of New York, USA.

Title: Accounting for Multilayered Unobserved Heterogeneity in Bivariate Probit Modeling with the Grouped Random Parameters Bivariate Probit Model with Heterogeneity in Means.

13:00-14:00 Lunch

14:00-14:30

Codruta Simona Stoica, Head, Mathematics & Statistics Unit, ATINER & Professor and Vice-Rector, Aurel Vlaicu University of Arad, Romania.

Title: An Alternative Approach to Difference Equations by Evolution Cocycles.

14:30-15:00

Milica Stojanović, Professor, University of Belgrade, Serbia.

Title: 3-Triangulations of p -Toroids.

15:00-15:30

Erh-Tsung Chin, Associate Professor, National Chunghua University of Education, Taiwan.

Shih Yu Yang, Graduate Student, National Changhua University of Education, Taiwan.

Hui-Ling Lee, Junior High School Teacher, Taiwan.

Title: Action Research of the Influence of Class Group Division Teaching on the Mathematical Learning Motivation and Achievements of Junior High School Low-Achievers.

15:30-16:00

Miemie Struwig, Professor, Nelson Mandela University, South Africa.

Title: Working Capital Management Research in South Africa During the COVID-19 Pandemic.

16:00-16:30

Stavroula Kalogeras, Associate Professor, University of Plymouth, UK.

Title: SmartBrands: The Story of Purpose and Mindful Branding in a Digital World.

16:30-17:00

Radmila Janicic, Professor, University of Belgrade, Serbia.

Title: Strategic Marketing Planning in Brand Building of Arts and Cultural Institutions.

17:00-17:30

Aarron Toal, Research Associate, Durham University, UK.

Title: Examining the Country-of-Origin Effect Through the Lens of Evolutionary Psychology.

17:30-18:00

Marilia (Maria) Kountouridou, PhD Candidate, European University, Cyprus, Cyprus.

Title: Brand Building in Higher Education: A Grounded Theory Investigation of the Impact of "Positive Visualisation Courses Upon Brand Identity".

18:00-18:30

Jerome Henry, Principal Advisor, European Central Bank, Germany.

Title: Reflections on Macprudential Reverse Stress-testing.

18:30-19:00

Samaneh Raiss Shaghghi, PhD Student, University of Szeged, Hungary.

Title: Poverty Alleviation in China: An Example of Jiangxi Province.

19:00-19:30

Constantin Colonescu, Associate Professor, MacEwan University, Canada.

Title: Price Markups: The Invisible Hand in your Pocket.

19:30-20:00

Stavroula Malla, Associate Professor, University of Lethbridge Canada.

Title: Assessing the Effects of Health Claim Regulations on Food Demand.

20:00-20:30

Gustavo Bittencourt Machado, Associate Professor, Federal University of Bahia, Brazil.

Title: Productivist Agricultural Systems to Multifunctional Agriculture in the Cocoa Agrarian System, in Bahia, Brazil.

Tuesday 29 June 2021

10:30-11:00

Giedre Dzemydaite, Associate Professor, Vilnius University, Lithuania.

Title: Economic Specialization, its Changes and Impact on Regional Economic Development in the European Union.

11:00-11:30

Chia-Hao Tsai, Graduate Student, National Chunghua University of Education, Taiwan.

Title: Pupil's Fraction Learning Based on Board Game Playing.

11:30-12:00

Ya-Lan Huang, Postgraduate Student, National Chunghua University of Education, Taiwan.

Title: The Change of Participants' Mathematics Knowledge for Teaching in a Primary School Teacher Professional Learning Community.

12:00-12:30

Wanting Zhao, PhD Student, Shanghai International Studies University, China.

Title: Analysis on the Differences of the Main Global Epidemic Fighting Models – Based on the Deep Research of Glacial Model.

12:30-13:00

Marco Mazzoli, Associate Professor, University of Genova, Italy.

Simone Lombardini, Research Fellow, University of Genova, Italy.

Title: Business Cycle in an Oligopolistic Economy with Entry and Exit.

13:00-13:30

Nikolai Brosch, Researcher, Technical University of Munich, Germany.

Title: Practice the Purpose Preach: Experimental Evidence on the Effect of Corporate Purpose on Workers Willingness to Go the Extra Mile.

13.30-14:00

Emilie Sartre, PhD Student, CREST-ENSAE, France.

Gianmarco Daniele, Assistant Professor, University of Milan, Italy.

Title: Toxic Loans and the Rise of Populist Candidacies.

14:00-15:00 Lunch

15:00-15:30

Leonida Correia, Associate Professor, Centre for Transdisciplinary Development Studies, Portugal.

Title: The Macroeconomics and the Construction Sector: Evidence from Portugal.

15:30-16:00

Paloma Lanza-Leon, Researcher, University of Cantabria, Spain.

Title: The Role of Social Exclusion and Vulnerability: An Approach Before the COVID-19 Pandemic in Spain.

16:00-16:30

Sofía Ruiz-Palazuelos, Researcher, University of the Basque Country, Spain.

Title: The Impact of Network Cycles on Employment and Inequality.

16:30-17:00

Sergio Cappellini, PhD candidate, Bocconi University, Italy.

Title: Unemployment Insurance, Learning and Worker Profiling.

17:00-17:30

Joshua Cova, PhD Candidate, Hertie School and Humboldt University, Germany.

Title: The Convergence Trajectories of European Minimum Wages: From 'Antiquated Anti-Poverty Tool' to Indicator of Changing Power Structures in Industrial Relations?

17:30-18:00

Dora Simon, PhD Student, University of Zurich, Switzerland.

Title: To Beef or Not to Beef: Trade, Meat, and the Environment.

18:00-18:30

Arpita Nehra, Graduate Student, Utah State University, USA.

Title: Regional Water Transfer and Economic Growth: A Synthetic Control Analysis.

18:30-19:00

Laura Lambdin, Clinical Assistant Professor, University of South Carolina, USA.

Title: Teaching University Gen Z Business Students in Synchronous Online Professional Business Courses.

19:00-19:30

Aradhana Kumari, Assistant Professor, Borough of Manhattan Community College, City University of New York (CUNY), USA.

Title: A Partial Nonlinear Extension of Lax-Richtmyer Approximation Theory.

19:30-20:00

Ampalavanar Nanthakumar, Professor, State University of New York at Oswego, USA.

Title: A Diagnostic Test based on a Mixture of Gaussian Copula Model.

Sheikh Shahriar Ahmed

Graduate Research Assistant University at Buffalo, The State University
of New York, USA

Sarvani Sonduru Pantangi

Research Associate, Michigan State University, USA

Ugur Eker

Cadet Pilot, Turkish Airlines, Turkey

Grigorios Fountas

Lecturer, Edinburgh Napier University, UK

Stephen Still

Professor, University at Buffalo, The State University of New York,
USA

&

Panagiotis Anastasopoulos

Associate Professor University at Buffalo, The State University of New
York, USA

Accounting for Multilayered Unobserved Heterogeneity in Bivariate Probit Modeling with the Grouped Random Parameters Bivariate Probit Model with Heterogeneity in Means

In the statistical and econometric modeling literature, the analysis of two interdependent binary dependent variables is usually conducted through a bivariate probit modeling approach. In this modeling framework, two separate equations are estimated while accounting for the contemporaneous cross-equation error correlation arising from the presence of commonly shared unobserved characteristics affecting both dependent variables. However, the traditional fixed parameters approach is inherently incapable of accounting for several methodological challenges arising from the presence of systematic unobserved variations across the data (also known as unobserved heterogeneity), as well as from the presence of unbalanced panels across the data. Not accounting for these issues may result in model misspecification and biased parameter estimates, and subsequent misleading inferences. To address these methodological challenges, we propose the incorporation of grouped random parameters with heterogeneity in means in the bivariate probit modeling framework. The grouped random parameters approach allows for estimating observational unit specific coefficients, which account for unbalanced panel effects. Furthermore, the heterogeneity in means approach allows

for unveiling the effects of explanatory parameters on the mean values of the random parameters.

The proposed approach is demonstrated by analyzing public perceptions towards safety and security related concerns that may arise from the future use of autonomous vehicles. The data consist of survey responses from 584 participants from the United States collected through an online survey, which was distributed by 34 individuals. The number of collected responses by each of the 34 survey collectors varied between 2 and 33, thus forming unbalanced panels in the collected data. The model estimation results indicated that the proposed grouped random parameters with heterogeneity in means approach results in statistically significant improvements in model fit, and sheds additional light on the collector-specific heterogeneity through the estimated grouped random parameters and heterogeneity in means coefficients.

Gustavo Bittencourt Machado

Associate Professor, Federal University of Bahia, Brazil

Productivist Agricultural Systems to Multifunctional Agriculture in the Cocoa Agrarian System, in Bahia, Brazil

This paper, entitled *Productivist agricultural systems to multifunctional agriculture in the cocoa agrarian system, in Bahia, Brazil*, aims to understand the processes of knowledge transmission in the history and changes of the cocoa agrarian system, considering the regional economic crisis that has been maintained since the 1990s, coming from the crisis of monoculture of the agricultural commodity. The transformations in rural areas are due to the expansion of rural settlements (social movements) and, a technical point of view, the transition from a partially productive agriculture to an ecological and multifunctional agriculture, through family agriculture and new agrarian reform settlements. The agricultural production systems in the cocoa region of the state of Bahia have been structured in the tropical forest biome (Mata Atlântica), in the secular *cabruca* production systems, recently recognized, as a Geographical Indication, by the Instituto Nacional de Propriedade Industrial - INPI (National Institute of Industrial Property - INPI), including, historically, those employers and family agricultural systems, that preserved the forest, where the cocoa was planted under secondary tropical forest, maintaining the extensive green of the south coast in this region.

Nikolai Brosch

Researcher, Technical University of Munich, Germany

Practice the Purpose Preach: Experimental Evidence on the Effect of Corporate Purpose on Workers Willingness to Go the Extra Mile

Commercial organizations increasingly (re)define their corporate purpose beyond profit maximization to create value by contributing to the welfare of society and planet. In this context, the present paper employs a two phase natural field experiment to investigate whether, when and how corporate purpose influences workers willingness to complete unrequired extra work. The main findings show that receiving information about an employer's corporate purpose causes workers to complete more extra work. Workers whose personal preferences match with the organization's purpose are most responsive. For those workers the communication of a corporate purpose in combination with an authentic purpose practice further increases their additional work performance, whereas a non-authentic purpose practice backfires. Furthermore, we find evidence that the underlying mechanism is primarily driven through an increase in workers meaning of work. In a broader context, the findings that workers are willing to go the extra mile working for an organization with purpose provide some empirical indications in support of the theoretically proposed business case of purpose.

Sergio Cappellini

PhD Candidate, Bocconi University, Italy

Unemployment Insurance, Learning and Worker Profiling

Efficient unemployment assistance is tailored to workers' individual skills. Since skills are difficult to infer, assistance is provided on the basis of their expected level, unless workers are profiled and their actual level of skills is therefore detected. A profiling program establishes (i) whom to profile, (ii) to which level of accuracy and (iii) at what stage of the program. The paper identifies the determinants of optimal profiling along these three dimensions in a principal-agent framework with moral hazard. Two are the main findings. First, workers with higher expected skills should initially be incentivized to privately search for a job, thanks to larger returns on search effort, and profiled only at a successive stage of the unemployment spell. Second, in choosing how accurately to detect high skills, the government trades off the savings realized on the incentive cost to private search, which are larger when profiling is more accurate, against the savings realized on low-skilled workers who are referred to private search and denied more expensive forms of assistance, which instead are decreasing in accuracy. However, partial detection of skills leaves room for future downward revisions of expectations, following failed search attempts, and demands larger payments to workers, in order to compensate for such additional risk. For this reason, assistance programs mixing profiling and private search should detect high skills with full accuracy.

Erh-Tsung Chin

Associate Professor, National Chunghua University of Education,
Taiwan

Shih Yu Yang

Graduate Student, National Changhua University of Education, Taiwan
&

Hui-Ling Lee

Junior High School Teacher, Taiwan

Action Research of the Influence of Class Group Division Teaching on the Mathematical Learning Motivation and Achievements of Junior High School Low-Achievers

This study is a portfolio record of the process about the class group division teaching from a junior high school mathematics teacher. It explores the difficulties encountered by low-achieving students as well as the corresponding teaching strategies, and addresses the influence on their mathematical learning motivation and achievement during the class group division teaching.

The research subjects are 22 mathematics low-achieving students in the researcher's teaching school. They are from three tutors including another two mathematics teachers of the same grade. Student mathematics scores are ranked from high to low, and the low achievement group comes from the lower quarter of the whole samples. A one-year, one-class-per-week, and two-stages action research from the seventh to the eighth semester is conducted. Data collection and analysis are mainly based on quantitative data, supported by qualitative data. The quantitative data include a mathematics learning motivation questionnaire and the student mathematics sectional examinations, while the qualitative data include student worksheets, teacher reflective diary, and semi-structured interview record. The results of the analysis also present evidence from quantitative and qualitative data to provide a detailed explanation of the research questions in this study.

Three major research findings show that:

1. Under the class group division teaching, teachers can design classroom activities through different teaching strategies, which can help both teaching and learning for students.
2. The class group division teaching can enhance the mathematics learning motivation of low-achieving students.
3. The class group division teaching can improve the mathematics

learning achievements of low-achieving students.

According to the results of the study, suggestions are made for school administration, parents of students, the class group division teaching, low-achieving students' teaching and future research, and references are given to teachers and researchers who want to conduct the class group division teaching.

Constantin Colonescu

Associate Professor, MacEwan University, Canada

**Price Markups:
The Invisible Hand in your Pocket**

Much of the current economic wisdom assumes that markets are competitive and that prices do not significantly depart from marginal costs. In reality, prices in most markets include substantial markups, a finding that may inform research on economic inequality. World input-output data allow calculating price markups by country and sector.

Leonida Correia

Associate Professor, Centre for Transdisciplinary Development Studies,
Portugal

The Macroeconomics and the Construction Sector: Evidence from Portugal

The construction sector has great economic and social relevance for the economies because it mobilizes very significant material and human resources. In particular, the construction production is considered to be one of the main indicators of the evolution of a country's global economic activity. This article aims to study the cyclical fluctuations of the construction activity and its relationship with the aggregate business cycles in Portugal over the last six decades. For this purpose, we start by analyzing the evolution of a set of indicators inherent to the functioning of the construction industry in the recent past. Next we extract the construction production cycles and examine their association with the Portuguese business cycles since 1960s, with particular attention to the times of economic crisis. Overall, the results show that the construction sector has been confirming itself in the Portuguese economy with an increase of its weight in aggregate output and that cyclical fluctuations of construction activity are strongly correlated with the fluctuations of the overall economy, although they exhibit much greater instability. Finally, we discuss the main problems that the construction is currently facing and, in particular, the effects of the pandemic crisis on this sector.

Joshua Cova

PhD Candidate, Hertie School and Humboldt University, Germany

The Convergence Trajectories of European Minimum Wages: From ‘Antiquated Anti-Poverty Tool’ to Indicator of Changing Power Structures in Industrial Relations?

In many advanced European economies within-country inequality and in-work poverty rates have steadily increased in the past decades. As the economic impact of minimum wages on employment and income inequality becomes better understood, a growing number of countries have recently introduced or re-introduced statutory minimum wages. The unprecedented emphasis on a policy tool that has existed for almost a century is to be situated within a context where trade union density rates and employment protection legislation (EPL) have dwindled and where governments play an increasingly important role in regulating industrial relations. By leveraging a unique time-series cross-sectional dataset on minimum and average wages, this project will show that minimum wages play a more significant role in income distributions. Furthermore, by availing itself of measurements of convergence derived from the economic growth literature, this project will show that EU member states have undergone a process of convergence. It will also be shown that convergence has proceeded more rapidly, in particular in the aftermath of the sovereign debt crisis, for minimum wages than it has for average wages. In addition, by including data on a set of macroeconomic and political covariates, several interesting relationships between minimum wage growth and changes to the European industrial relations landscape can be detected. While left-of-centre governments can be expected to be in favor of more generous minimum wages this relationship is mediated and conditioned upon the extent to which labour market institutions and social actors ‘take care’ of wage-setting for the low-pay sector. As the importance of social actors has declined in recent years we can expect partisanship to play a more determinant role in the setting of minimum wage rates. The results show that while the ideological persuasion of incumbent governments does not seem to be associated with a particular direction in the progression of minimum wages, the indirect relationship between trade union density rates, EPLs, in-work poverty rates and minimum wage growth seems evident.

Lazar Djurovic

Teaching Assistant, University of Belgrade, Serbia

&

Miroslav Todorovic

Full Professor, University of Belgrade, Serbia

Why Corporate Governance Cannot be Improved Easily: A Behavioural Perspective

Despite more than two decades of intense efforts to improve the functioning of the board of directors as a proclaimed essential mechanism of corporate governance for value creation and/or prevention of value destruction by management, fierce criticism of the role of this key control mechanism of a modern corporation is not rare. Criticism goes to extremes that the boards are declared as unusable and guilty of destroying the American economy, which cost citizens trillions of dollars.

In this paper, we consider the most significant behavioural phenomena which can significantly affect the behaviour of each board member, but also the behaviour of the board as a group. Excessive self-confidence of board members, group thinking, the casino effect of prospect theory, aversion to loss, etc. can seriously jeopardize the effectiveness of the board on both fields: performing the monitoring function and shaping incentives for management. Moreover, the dynamics of the group that connects board members can often make them blind to their mistakes and failures. The board may be prone to make obviously wrong decisions due to the mere tendency to maintain the cohesion and homogeneity of the group. Studying behavioural perspective is very important, because a better understanding of the cognitive biases and psychological traps that board members fall into could remove the obvious obstacles that undermine the improvement of corporate governance today.

Thomas Dobbelstein

Professor, Baden Württemberg Cooperative State University, Germany
and Durban University of Technology, South Africa
&

Vannie Naidoo

Professor, University of KwaZulu - Natal, South Africa

**The Influence of Personality Traits of Millennials on the
Buying Behaviour during the COVID-19 Pandemic -
A Comparative Study between South Africa and Germany**

Germany, as a developed country, and South Africa as a developing country felt devastating impacts during COVID-19, especially in the retailing industry. The research analyzes the changes in shopping behaviour of millennials, born 1980–2002, before, during and after the lockdown in South Africa and Germany. It takes a look at different product categories, like groceries, toiletries, personnel protective equipment and alcohol. General personality traits of the millennials like well-being & optimism or self-consciousness are measured based on exploratory factor analysis, also corona specific personality traits like fear & hurdle or stress. Based on regression analyses the influences of the general and Corona specific personality traits on buying behaviour in the selected product categories before, during and after lockdown are analyzed.

The data was collected online between 30.07.20 and 21.08.20 using an online access panel in South Africa and a convenience sample in Germany. In Germany the population consists of all millennials, in South Africa it concentrates on millennials belonging to the wealthier LSM (Living Standard Measure) groups 7–10. Quotas for age, gender and income are used in both countries. The final analysis after quality checks is based on 949 participants in Germany and 676 in South Africa.

The shopping behaviour of the millennials shows significant changes during the three stages for many product categories (partly based on legal regulations during the lock down stage), as well as significant differences between the countries. Salient results are e.g.: In both countries, food & groceries are generally purchased more, in South Africa significantly more than in Germany. The volume of food & groceries purchases in both countries is declining throughout the course of the pandemic. In both countries clothing is generally purchased less. The volume of clothing purchases in both countries is declining before and during lock down and increasing afterwards, but not reaching the level before Corona. Personal Protective Equipment

and Medical supplies are generally purchased more during all three stages. The volume of purchase in Germany is – after a high start before lock down - declining in the course of the pandemic, while South Africa reaches its peak during the lockdown.

Corona specific personality traits show very different results. The fear & hurdle dimension is much higher in South Africa than in Germany; stress slightly higher. Fear and hurdle also have a highly significant influence on the buying behaviour of different product groups like groceries, toiletries, personnel protective equipment and alcohol- with high differences between Germany and South Africa. During all three stages fear & hurdle show a positive, highly significant influence on buying alcoholic beverages. Referring to the personality trait stress, results are contrary: higher levels of stress lead to higher purchase of alcoholic beverages in all three stages.

The better understanding of the buying behaviour of millennials and the personality traits which drive their behavior guides retailers in their marketing, e.g., by addressing specific personality traits to increase sales during a pandemic. It is also the foundation for governments for creating legal restrictions during a pandemic.

Viktar Dudzich

PhD Student, Prague University of Economics and Business, Czech
Republic

The FDI Home Country Impact on the Productivity of the Hosts

This paper seeks to explore the relationships between the foreign direct investment (FDI) origin countries and economic performance of the recipients. While the overall positive effects of FDI on the hosts' economic growth, productivity and export competitiveness are already elaborately explained with help of spillover effects, technology transfer and knowledge diffusion, there have been only limited attempts to evaluate the potential divergence of impacts produced by the FDI from different home nations. This work intends to fill the gap by appraising if the economic and institutional characteristics of the FDI providers influence the positive effects on the host countries' macroeconomic performance.

To achieve that, we employ the piecemeal data on bilateral FDI flows collected by United Nations and International Trade Center and construct an extensive dataset of top providers of FDI for 26 emerging markets and developing nations and a period of 2001–2018. The exact time and country composition of the constructed dataset was determined by the availability of the reliable data on bilateral FDI flows. Subsequently, we calculate the average level of economic, institutional and political development of the top 10 FDI origin countries for every host country/time period in the examined sample. The selected indicators for evaluating the FDI providers include GDP per capita as a gauge of economic development and multidimensional indexes of economic and political freedom as a measure of quality of institutional environment. As a next step, we regress the productivity growth in the recipient nations, which is often considered to be the most consistent output of the FDI inflows, on the computed indicators of the hosts' top investors, simultaneously controlling for the impact of host characteristics which are assumed to be of influence on the FDI effects. Our results indicate that the level of economic development of the investing nation is in positive causal relation with the productivity growth of the recipient, while the home countries' institutional environment is relevant for the host only if we do not control for the host's level of economic and civil rights.

Up to our knowledge, this paper is the first attempt to evaluate the significance of the FDI origin countries' macroeconomic and

institutional performance on the hosts' productivity employing panel data and using the bilateral investment flows between the host and up to top 10 FDI providers commonly accounting for up to 95% of FDI inflows to the recipient. The results provide applicable implications on the potential orientation of the pro-FDI policies of the nations aiming at enhancing local productivity by attracting foreign investment.

Giedre Dzemydaite

Associate Professor, Vilnius University, Lithuania

Economic Specialization, its Changes and Impact on Regional Economic Development in the European Union

Recently, there is a sharply growing interest in specialization and industrial change in the European Union both from governmental institutions and academic society. The smart specialization concept was implemented in the EU innovation policy in 2014, stating that regions have to find their path to regional development and to specify areas where to concentrate efforts and to specialize for developing innovative activities. More specialized region supposes to have a comparative advantage in that field. However, there are different arguments linking specialization to regional economic development. This research follows these thoughts and gives insights into specialization changes in the EU and its impact for economic development. Location quotient (LQ) index was calculated for evaluating the level of specialization. Herfindahl index of geographical concentration and LQ index were used to select tradable sectors. Overall, 48 sectors of NUTS1 regional level were involved in a panel data analysis. This research supported the idea that a majority of European regions were comparatively more diversified than specialized. Higher specialization rates in the EU regions were inconsistently associated with higher gross value added with positive but statistically insignificant effects.

Jerome Henry

Principal Advisor, European Central Bank, Germany

Reflections on Macroprudential Reverse Stress-Testing

The Corona crisis has unique features, e.g., its severity went far beyond previously conducted system-wide stress test scenarios, and it is characterised by an exceptionally high level of uncertainty on forward-looking developments. This connects to theoretical work on worst case scenarios and reverse stress-testing. While a supervisory requirement in many jurisdictions - as recommended by EBA or the BIS, reverse stress testing has not been to date part of the toolkit for system-wide or macroprudential stress-testing. In this paper we envisage objectives the latter could be assigned to and accordingly how its implementation could be designed. Based on the existing literature, we also suggest practical options for conducting such exercises top-down, i.e., using simulations from authorities' own models. We moreover illustrate how a complex macroprudential stress-test model could be run for that purpose, in a parsimonious but effective manner, i.e., without necessarily requiring fully-fledged and extensive stochastic simulations. While rank-reduction techniques help solve the dimensionality problem, the assumed probabilistic distribution of shocks remain a critical element in the analysis.

Ya-Lan Huang

Postgraduate Student, National Chunghua University of Education,
Taiwan

&

Erh-Tsung Chin

Associate Professor, National Chunghua University of Education,
Taiwan

The Change of Participants' Mathematics Knowledge for Teaching in a Primary School Teacher Professional Learning Community

A teacher professional learning community [PLC] should effectively operate through sharing teaching resources, professional dialogues, and collaboration to reduce pupil's learning achievement gap and make teaching close to their learning experiences through providing suitable learning scaffoldings. This study adopts a qualitative research method to investigate the change of participants' Mathematics Knowledge for Teaching [MKT] of a primary school teacher PLC which has been running for three years. The three research subjects are experienced teachers with more than ten years of teaching, and none mathematics or science majors. According to the framework of MKT (Hill, Ball, & Schilling, 2008), the collected qualitative data, which include PLC meeting videos, lesson observation sheets, interviews, and learning feedbacks, are analyzed and triangulated by the researchers and other mathematics educators. The results show that PLC may help teachers improve their MKT. utilizing the in-depth discourse within the PLC meetings, collaborative lesson preparation, peer lesson observation, and analyzing exam items, the participants could transfer the sharing resources to their own teaching practices, and manage to learn actively. At the beginning of the PLC, the discourse was mainly related to the teacher's Knowledge of Content and Curriculum [KCC] and Knowledge of Content and Teaching [KCT]. It reveals that the participants ought to be energized in KCC and KCT, and the PLC activities should be specially arranged in these two aspects. After the continuous professional dialogue and teaching practices, the teacher's KCC, Knowledge of Content and Student [KCS], and Special Content Knowledge [SCK] are improved most significantly, which also promotes the student learning achievements.

Radmila Janicic

Professor, University of Belgrade, Serbia

Strategic Marketing Planning in Brand Building of Arts and Cultural Institutions

The paper present theoretical and practical aspects of strategic marketing planning in brand building of arts and cultural institutions. Focus of the paper is on developing theoretical aspects of strategic marketing planning in brand building of arts and cultural institutions. The theoretical part of the paper is based on modern literature in the field of strategic marketing planning, brand building, arts and culture. The key hypothesis of the paper is that brand building of arts and cultural institutions have to be based on strategic marketing planning, on strategic marketing analysis, implementation of marketing strategies and strategic marketing control. The special aspect of the paper is strategies of brand building of arts and cultural institutions. In the empirical research the paper will present case studies about implementation of strategic marketing planning in brand building of arts and cultural institutions. The empirical research will include results of questionnaire research about perception of arts and cultural institutions as brand, about approaches of experiences about arts and cultural institutions, about identity and image of arts and cultural institutions, about specific strategies that could build brand of arts and cultural institutions. The research in the paper will be qualitative and quantitative, with primary and secondary data. The empirical research will analyze impact of experience marketing, emotional branding strategies and traditional brand strategies in development of arts and cultural institutions brand. In the case studies the paper will present good examples of strategic marketing planning in brand building of arts and cultural institutions. The results of empirical research will lead to further theoretical and practical analysis of brand building of arts and cultural institutions. The paper presents modern ways of development of arts and cultural institutions. The paper will analyze impact of social media on brand building of arts and cultural institutions. The paper will analyze new professions in arts and culture and new brand strategies that could be implement in digital environment. The paper will analyze connection between traditional strategies of brand building of arts and cultural institutions and strategies of brand building of arts and cultural institutions in digital environment. Special aspect in the paper will be given on synergy of

traditional and digital marketing strategies in brand building of arts
and cultural institutions.

Stavroula Kalogeras

Associate Professor, University of Plymouth, UK

**SmartBrands:
The Story of Purpose and Mindful Branding in a Digital
World**

Branding from the inside out is an approach to create authentic relationships built on trust. The inside out approach recognizes that humans are interconnected, dependent, and affected by each other. Therefore, the brand's character in moral virtue is essential to sustain positive relations and exchanges. The moral character of a brand that is intimately known by an organization can better assist people far beyond products and services to learning, practicing, and responding to life in a better way. A defined brand character can elevate the brand and focus on human necessity, a better understanding of self, and how to respond to life itself. The paper looks at the human character from the inside out and how that transcends to brand character from an inside out approach. A philosophical approach to branding that considers self-brand coherency to brand-self coherency and reasoned choices is highlighted. A well-developed character in a novel is vital to a story as it is with a well-developed brand to the market and the reader interprets both. It is impossible to embody perfection in our ethos, our character, but it is possible to try for perfection and completeness continually. As products and services, humans are unfinished to the end – and the sooner humans can understand this concept, the freer from anxiety, fear, and ungraciousness they will be. The work discusses how the moral character of a brand and our interconnectedness can lead to positive, authentic, and valuable exchanges. Internal possessions are more important than external possessions, but they can work together when bonded by moral reasoning and human compassion. Integrating the inside with the outside can bring more coherency and value to brand connections.

Marilia (Maria) Kountouridou

PhD Candidate, European University, Cyprus, Cyprus

**Brand Building in Higher Education:
A Grounded Theory Investigation of the Impact of
“Positive Visualisation Courses upon Brand Identity”**

Globalisation has rapidly changed the business environment and inevitable as it was, managed to affect the university sector as well. The higher education sector is comparable to businesses and as a result, they face the same challenges. It is a key implication for universities to focus on developing a strong and successful brand image. The purpose of this research is to investigate whether “positive visualization courses in brand identity” can affect a freshmen’s perception towards a university brand image. Taking into consideration the research question, a qualitative approach has been selected as the most suitable for this study. The proposed methodology for the study of the aforementioned area is Grounded theory. In order to collect data, an experiment will be carried out where positive visualization courses in brand identity will be conducted among first-year university students where the brand personality, past achievements, its values, its philosophy, and its mission will be highlighted.

Aradhana Kumari

Assistant Professor, City University of New York, USA

A Partial Nonlinear Extension of Lax-Richtmyer Approximation Theory

In the paper “Survey of the Stability of Linear Finite Difference Equations (1956) Peter Lax and Robert Richtmyer develop a theory to approximate numerically the solution of the initial value problem that guarantees, under certain circumstances, the convergence of a numerical solution of linear initial value problem. Their assumptions are first that the algorithms approximate the differential equation under study (this is called consistency and, secondly, that the initial value problem is well-posed (which means that the solution exists, are unique and depends continuously on the initial data). Under these assumptions, the stability condition (which requires that errors in the algorithm do not accumulate nor increase as one iterates the algorithm) is necessary and sufficient for convergence in a certain uniform sense for arbitrary initial data. In this work, we will extend certain aspects of their work to the nonlinear context. We drop the PDE and well-posedness assumptions at first and add the “ β -axioms” that will guarantee convergence of algorithm orbits in a projective limit of finite-dimensional vector spaces. We formulate a conjecture for a partial converse that some stability is a consequence of convergence for a natural class of nonlinear algorithms where deviation of these algorithms from being linear are bilinear maps. We define a new notion of a numerical solution. We prove that a numerical solution obtained from a consistent difference algorithm that lies in the domain of the operator on the right hand side is a true solution of the PDE.

Laura Lambdin

Clinical Assistant Professor, University of South Carolina, USA

Teaching University Gen Z Business Students in Synchronous Online Professional Business Courses

The tedium increases dramatically; students who are normally classroom rock stars begin underperforming; absence rates increase. These are the issues facing my colleagues and myself now that our face to face interactions with our business students have been curtailed because of COVID-19. How do we make online synchronous course time more compelling for our Gen Z students? This study intends to clarify and then judge the effectiveness of several sorts of quick and simple methods of engagement by using four or five different types during each class period.

This is part of a twenty year personal evaluation of using “ice breaking games” and fun activities at some point during every class meeting to encourage students to know one another better and to encourage everyone to think of the course as fun (although the learning outcomes remain challenging).

Varieties of small groups are constant and meet every other course period so that students can get to know the other four people in these groups of five fairly well. These include a project team, book club, major within business group, and writing group. These assigned groups are constant and stable all semester. Short answer questions are answered within groups who report back after seven minutes (because five minutes was too short and ten minutes felt too boring.)

Other “short bursts of time” activities have been more prepared like an opening microphone and camera check in with each student at the beginning of every class. Preplanned and fast check in ideas combined with the mic/camera check that have worked well are wear your favorite hat/costume, let us meet your pet/roommate, superhero day, wear your pajamas, and show and tell.

Games like Kahoot, word search, anger management, and ethical issue discussions have worked well, as has sudden polling. Another way of keeping the atmosphere light and hearing from everyone is to ask a question that everyone must answer differently. This forces all to tune in and listen to the other responses.

Helicopter mom isn't my teaching style so keeping track of teams is done with the leader sending me and all members an agenda. This is followed up by a weekly email from each student about what was useful and significant from their meetings that week. There are also 15

weeks of common ground prompts like find three foods everyone in your group likes or three music artists everyone enjoys.

My current favorite bonding activity is having five group members share a funny, G-rated story, pick the best one, and share that one with the whole class.

Thinking through ideas for games and activities that will allow online synchronous classes a better experience has become my passion project. Although quick games were always part of my pedagogical style, not everything translates well to online teaching. I am determined to continue culling these ideas because of the richness these details add to the student experience.

Paloma Lanza-Leon

Researcher, University of Cantabria, Spain

Marta Pascual-Saez

Professor, University of Cantabria, Spain

&

David Cantarero-Prieto

Professor, University of Cantabria, Spain

The Role of Social Exclusion and Vulnerability: An Approach before the COVID-19 Pandemic in Spain

With the COVID-19 pandemic, the Europe 2020 Strategy approved by the European Union in June 2010, in particular, the target that by 2020 there should be at least 1.4 million fewer poor people in Spain, is not being achieved. On the contrary, social exclusion and vulnerability increase as the number of reported confirmed COVID-19 cases continues to rise.

In this scenario, the present study is meant to analyze the risk for vulnerability to social exclusion. More specifically, this article investigates the severe deprivations that people face before the health and economic crisis derived from the pandemic in the different Spanish regions. To do so, the last available wave (2019) from the Spanish Living Conditions Survey is used. It is necessary to highlight that social exclusion covers several items. Therefore, in this paper, six deprivation domains have been distinguished to examine the vulnerability to social exclusion: economic, housing, environment, education, labour, and health. For this purpose, households and adults who suffer from lack in any of the domains mentioned have been considered. In terms of methodology, the multidimensional statistical technique of Factor Analysis is considered, and the sum-score approach is used to construct the social exclusion index.

The results revealed that there was a population group who presented a large number of vulnerability factors and, therefore, these individuals had greater risk of social exclusion. When comparing social exclusion severity distinguishing between geographic areas, the findings corroborate that regions from the South of Spain present worse outcomes - higher risk for vulnerability to social exclusion -. In addition, more than 40% of individuals in these regions are in social exclusion. Looking at the Northeastern Spain, less than 20% of individuals are living in social exclusion - lower risk for vulnerability -.

In this context, policy makers need to design and establish social public policies focused on reducing social exclusion in terms of

economic, housing, environment, labor, education, and health fields, especially, now, due to the COVID-19 pandemic.

Jose Lopez-Gracia

Professor, University of Valencia, Spain

Alejandro Casino-Martinez

Associate Professor, University of Valencia, Spain

&

Reyes Mestre-Barbera

Associate Professor, University of Valencia, Spain

Regulatory Environment and Capital Structure in Private Firms of the EU

This study analyses the influence of the institutional environment on firms' capital structure in the European Union (EU). Unlike other research papers we focus on private firms and include data that have been sourced from all countries belonging to the EU during the period 2010 to 2018. We split the sample between small and large firms and conjectured that institutional effects on financing policies vary with size those effects being greater for the former group as it faces more information asymmetry problems. Applied regression models also control for firm-level characteristics and relevant macroeconomic factors. Our findings reveal that high quality of the regulatory environment such as the legal rights of borrowers and lenders negatively affects firms' leverage. Moreover, the efficiency on the enforcement of commercial contracts positively influences firms' leverage. Lastly, the development of the financial system and bank concentration seem to directly affect firms' financing policies.

Stavroula Malla

Associate Professor, University of Lethbridge, Canada

K.K.Klein

Professor, University of Lethbridge, Canada

&

Taryn Presseau

Professional Affiliate, University of Lethbridge, Canada

**Assessing the Effects of Health Claim Regulations on Food
Demand**

NOT AVAILABLE

Marco Mazzoli

Associate Professor, University of Genova, Italy

Business Cycle in an Oligopolistic Economy with Entry and Exit

In this paper we introduce a microfounded macromodel with endogenous market structure, where macroeconomic fluctuations may be determined by firms' strategic interactions, entry and exit. All the agents have the same preferences but may differ in their budget constraints and change their social status according to idiosyncratic stochastic shocks that trigger entry, while exit is caused by firms' bankruptcies. Our numerical simulations show that birth and death of firms (associated with entry and exit) can generate macroeconomic fluctuations without technology shocks.

Ampalavanar Nanthakumar

Professor, State University of New York at Oswego, USA

A Diagnostic Test Based on a Mixture of Gaussian Copula Model

Here in this paper, we investigate the performance of a diagnostic test based on a mixture Gaussian Copula which incorporates a Markov Chain. Suppose that in the context of an infectious disease, there are 3 states; Susceptible (S), Infected (I), or Recovered (R). We believe that these three states follow a transition pattern according to the following matrix,

$$\begin{matrix} b & 1-b & 0 \\ 0 & c & 1-c \\ 0 & 0 & 1 \end{matrix}$$

Say that at time = 1, the state space has the probability distribution given by $(a \ \beta \ 1-a-\beta)$

Let S_1 be a health related pre-treatment measurement taken at time =1 from a subject who lives in the region where the infectious disease is prevalent. Moreover, let us suppose at time = 1, for those who are susceptible, the distribution is $N(\mu_{11}, \sigma^2_{11})$; for those who are infected, the distribution is $N(\mu_{12}, \sigma^2_{12})$; for those who have recovered, the distribution is $N(\mu_{13}, \sigma^2_{13})$.

Similarly, let S_2 be a health related post-treatment measurement taken at time =2 from the same subject who lives in the region where the infectious disease is prevalent. Moreover, let us suppose at time = 2, for those who are susceptible, the distribution is $N(\mu_{21}, \sigma^2_{21})$; for those who are infected, the distribution is $N(\mu_{22}, \sigma^2_{22})$; for those who have recovered, the distribution is $N(\mu_{23}, \sigma^2_{23})$.

We are using the probability $p = P(S_2 < S_1)$ to estimate the effectiveness of the treatment. In other words, we are evaluating the diagnostic ability of the measurements. The set of measurements that yield a higher probability constitute a better diagnostic test. But computing this probability involves the joint distribution of (S_1, S_2) . This is where we need the Copula. Here, we use a mixture Gaussian Copula which captures the transition among the states and at the same time gives a fairly approximate estimate of this probability $p = P(S_2 < S_1)$.

Arpita Nehra

Graduate Student, Utah State University, USA

Regional Water Transfer and Economic Growth: A Synthetic Control Analysis

This paper explores the impacts of the Owens Valley water transfer, one of the biggest and oldest agriculture-to-urban water transfers in the United States. Researchers have highly criticized this transfer stating that the County of Los Angeles "stole" water from Owens Valley farmers based on exaggerated water demand. Our theoretical and empirical models state that the water transfer facilitated economic growth in Los Angeles. We employ a synthetic control method with Gross Domestic Product per capita as the dependent variable and support our results using difference-in-differences analysis, showing that the economic growth of Los Angeles was higher after the water transfer. Moreover, results showed that the increase in GDP per capita from the manufacturing sector, whereas there was a negative impact on the agricultural sector.

Samaneh Raiss Shaghghi
PhD Student, University of Szeged, Hungary

Poverty Alleviation in China: An Example of Jiangxi Province

Poverty is a universal issue, and anti-poverty measures are historical tasks taken by all the societies as well as civilizations from thousand years ago. China is extensively known for its achievements in reducing absolute poverty since the reforms in the late 1970s. Fast economic growth, together with a well-funded national poverty reduction program, has led to a massive reduction in rural poverty during the past 25 years. Winning the battle against poverty is the most challenging task for building a well-off society in an all-round way. Under the current standard, the poverty-stricken rural population decreased from 98.99 million at the end of 2012 to 16.6 million at the end of 2018, with an average annual poverty reduction of 13.73 million. By 2020, the rural poor population will be moving up out of poverty under the current standards of China, and all poor counties will take off their hats to solve the overall regional poverty.

The aim of this paper is to demonstrate the polity measures applied by the Chinese government in order to combat and eliminate poverty and the standards they apply. Measures and standards will be exemplified by counties and villages located in Jiangxi province.

Stephane Fotis Roume

Assistant Lecturer, University of West Indies, France

Security Bubble Over

As Constant rightly told us in the XIXth century, the liberty of the Moderns is a special kind of liberty. This liberty – we will keep in mind for all the paper – is a right to be subjugated only by Laws and to be able to conduct our own affairs in security which is, in this point of view, progress. We will not discuss here about the interrelation between one's own interests and Laws. Our main point will be focused on the idea of this security which, from a *medium* to achieve our interests, seems to have become an end in itself. This can even be contradicting its original purpose. Then, we will focus on this concept of security in two points concerning a representation of security (I) and some effects of its overweighting (II). For this paper, we were highly inspired by classical authors (Adam Smith, Jeremy Bentham, David Hume, Etienne de la Boétie...) but their light can be ever brighter as their reflexions or observations can be more and more contemporary.

I – Security: A Liberty's Present...

As we told it, in Constant's perspective, liberty is a right guaranteed by Laws. This kind of liberty cannot be possible if there is no security with it. How could we be *sure* achieve our interests if we are not secure? Therefore, Laws are a protection of each of our own sphere. Then the phenomenon of security in the world we live can be represented like a bubble in which each person is. A perfect security or a perfect bubble is as much a part of the Champagne as a contradiction of this same. In it, we can live safely, healthy and do what we want, organising and ordering everything: indeed, in a system of laws, all what is not determinated is allowed. Like this, each can achieve his interests without greatly disturbing the other's ones – and we can still have the Legislation or the Legislator as the arbitrator.

Currently, security is a foundation of a viable economic system. However, it is also highly dependent of its own context. It is an answer as well a way of living inside and outside the 'real' world. This approach is simply utilitarianism, an approach of fictions where bureaucracy has a solely positive role. This approach of fictions, according to David Hume and Jeremy Bentham, does not mean that nothing is real but that everything we use to live, by habit, can become

real. Then, a story of causalities can be told – and it really matters who narrates – in which we can believe until we live new experiences.

II – ... Or an Omnipresence

This habit of a continuous story in a confined place can even make us lose our own liberty of judgment, in which we are ruled without recognizing it. We can also lose our martial spirit, a kind of new bond in this bubble of contentment. At the same time, we can forget the reason of existence of this bubble world, just needing new tales, positive or negative – without martial spirit, we have forgotten that each can be part of the narrowing for protecting his interests for example.

Instead of that, while each bubble seems to constrict more and more, we are living probably a different level of security, with which Constant would disagree. In his speech, he emphasised the possibility of use and abuse of our own property as a guarantee, which is hardly imaginable today. Even choosing our own industry is more and more a struggle at least in France, where education is more and more predestined for example.

Even for our grammar or our style or our thinking, the *politiquement correct* is already present in our writing programs... What we have lived for months for our own sanitary security is just the continuation of this evolution.

Sofía Ruiz-Palazuelos

Researcher, University of the Basque Country, Spain

The Impact of Network Cycles on Employment and Inequality

How do short network cycles - the building component of close-knit neighborhoods and the clustering coefficient - affect diffusion on networks? We explore this issue in labor markets by explicitly modeling the flow of information about vacancies in social networks. We show that short network cycles induce stochastic affiliation in the diffusion of job information, generating search frictions, with important microeconomic and macroeconomic consequences. Short network cycles affect inequality patterns within and across networked societies. In particular, they organize employment probabilities in the sense of the second-order stochastic dominance. *Ceteris paribus*, people in close-knit neighborhoods or dense networks exhibit worse and more unstable labor market outcomes. Since dense, overlapping neighborhoods is one aspect of strong relationships, we uncover a mechanism behind *the strength of weak ties* (Granovetter, 1973). Short network cycles induce further spacial and temporal correlations in employment status, shaping labor market transition rates and aggregate employment fluctuations.

Farida Said

Associate Professor, LMBA Laboratory, University of South Brittany,
France

Iehann Eveno

Research and Development Engineer ENSIBS Engineering School,
University of South Brittany, France

&

Jeanne Villaneau

Emeritus Associate Professor, IRISA Laboratory, University of South
Brittany, France

Towards Generating Real-World Datasets for Teaching Statistics in Industrial Engineering

Introduction: Driven by digital transformation, companies are nowadays producing large amounts of data. In industrial activities, for example, the increasing use of connected devices or interconnected machines contributes to this data abundance. However, very few enterprise datasets are made freely available which results in a serious lack of open real data for research and education. In this paper, we present a simulation tool that was developed to simulate different scheduling scenarios in a manufacturing environment. The generated data may be used for the purpose of designing a more cost-effective strategy for optimizing some type of performance measure, such as reducing production time, improving quality, eliminating wastes, maximizing profit...

We propose to present some practical cases of use of this tool to support industrial engineering students in their learning of statistics and data mining techniques.

Description of the tool: It simulates the manufacturing process of a pastry factory which includes the four tasks illustrated in Figure 1.

Figure 1. *Manufacturing Process*



Various raw ingredients are mixed and kneaded to form a dough which is baked in an oven. Once cooked, the pastries are bagged and palletised. Several factors are involved in the completion of each task and any variation in one of them impacts the rest of the process. For example, a stoppage during baking will result in under or overcooking of pastries and their subsequent disposal. This in turn will have an impact on the number of products to be bagged and palletised.

Different scenarios can be built by setting input parameters such as production load, size or weight of the manufactured products as well as operating parameters of the machines, the production process, etc.

The output data relate to production (number of rejects, product quality...), to the machines (energy consumption, failures...) and to the environment (factory temperature, outdoor humidity...). In total, more than 30 variables are simulated. They reflect the evolution of the production over time, with a time increment ranging from one minute to one day. Plant operation can be simulated over long periods of time (up to one year) and the simulated data are recorded in csv files.

Cases of use to be developed in a future version: Providing students with real-world industrial datasets allows them to better understand their future profession. On the one hand, the input parameters of the simulation tool are typical of enterprise resource planning (ERP) and industrial strategy (production load, number of employees, sampling rate...). On the other hand, the output data are typical of SCADA type feedback (supercision) and allow the measurement of production indicators. Simulated data can therefore serve different purposes.

They can be used to analyze the production behaviour and to identify the most significant key performance indicators (overall equipment effectiveness, capacity...). More generally, implementing Statistical Process Control and design of experiments helps to refine the company's strategy and to anticipate the measures to be adopted in order to improve its industrial processes.

Through data analysis, it is possible to establish the critical phases of the production process and to understand the involvement of the physical environment in production quality. Industrial factors such as process or equipment failures leading to production line stoppages can also affect production. By crossing the data collected throughout the manufacturing process, one may analyze the factors that affect product quality using inferential statistics and data mining techniques.

Emilie Sartre

PhD Student, CREST-ENSAE, France

Gianmarco Daniele

Assistant Professor, University of Milan, Italy

&

Paul Vertier

Researcher, LIEPP, France

Toxic Loans and the Rise of Populist Candidacies

The role of financial crises in boosting populism has been well documented. Yet the specific mechanisms through which this occurs remain elusive. This paper studies how populist candidacies were fueled by a public financial scandal, triggered by market volatility and financial deregulation. Using an instrumental variable strategy, we exploit the leak of a list of French municipalities which contracted “toxic” loans prior to the crisis as a source of identification. During the subsequent municipal elections, using an instrumental variable strategy, we show that i) populist parties were the main political parties experiencing an increase in vote share, while the incumbent’s political party was electorally punished, ii) both far-right and far-left populist candidacies were more likely in municipalities affected by the scandal, leading to a rise in electoral competition, iii) for the populist far-right, these results were stronger in economically fragile municipalities and in cities with a higher growth of the immigrant population. Importantly, the findings are not driven by the economic aftermath of the scandal and suggest that public finance mismanagement disclosure contributes by itself to the rise of populism during financial crises.

Dora Simon

PhD Student, University of Zurich, Switzerland

**To Beef or not to Beef:
Trade, Meat, and the Environment**

The agricultural sector is the second largest contributor to greenhouse gas emissions. How can food consumption choices reduce emissions? I estimate a model of meat demand using purchasing data of meat and other protein rich products from a European retailer. I combine the purchasing data with data on production and transport emissions. In several counterfactual exercises, I analyze the reaction of consumers to some popular, supposedly eco-friendly food consumption policies. Contrary to popular belief, I find that buying local increases emissions by around 5% compared to the status quo. While vegetarianism decreases emissions by around 17%, consuming no beef and cheese yields the highest decrease in emissions of around 34%. My results show that consumer behavior can have a large impact on the emissions of food consumption.

Codruta Stoica

Professor, Aurel Vlaicu University of Arad, Romania

An Alternative Approach to Difference Equations by Evolution Cocycles

Given the results of recent years, the mathematical models for various phenomena issued from economics, engineering or biology, which are constantly growing in sophistication, can be also approached by studying the associated evolution equations and discrete-time dynamical systems by means of evolution families.

One of the important steps in the domain of evolution equations is due to D.B. Henry, who, in 1981, studied the property of dichotomy in the discrete setting. In the spirit of O. Perron's classical theory initiated in 1930, D.B. Henry characterizes the existence and invariance at perturbations of the property of exponential dichotomy for families of evolution operators in terms of input-output type conditions.

With respect to the results obtained in this field, we consider in this paper the notion of discrete-time evolution cocycle in Banach spaces. A unified treatment for some uniform asymptotic properties, such as stability and instability is emphasized. We also propose a new concept of exponential dichotomy. The main results are extensions in the discrete setting for some well-known results of the stability theory. Various applications in the real world are also provided.

Milica Stojanović
Professor, University of Belgrade, Serbia

3-Triangulations of p -Toroids

There are examples of non-convex polyhedra showing that it is not possible to make their decomposition into tetrahedra. Opposite, it is known that we can always divide convex polyhedra into tetrahedra. Such process is known as 3-triangulation. Polyhedra topologically equivalent to sphere with p handles, shortly p -toroids, could not be convex. So, here we shall investigate possibilities of their 3-triangulations and if some exists, its properties. It is of interest the minimal necessary number of tetrahedra for the 3-triangulation of a 3-triangulable p -toroid. For that purpose we shall develop the concepts of piecewise convex polyhedra and of graph of connection. Also, some interesting examples will be shown.

Miemie Struwig

Professor, Nelson Mandela University, South Africa

&

Storm Watson

Lecturer, Nelson Mandela University, South Africa

Working Capital Management Research in South Africa during the COVID-19 Pandemic

This study provides a critical analysis of working capital management (WCM) research in South Africa during the COVID-19 pandemic. The COVID-19 pandemic has disrupted every aspect of human life, from health to the economic system. Businesses need to respond swiftly to the extreme changes, and adopt a proactive approach to working capital, to ensure a greater chance of successfully overcoming the many challenges. This research uses five stages to investigate WCM research and critically analyses and proposes ways to deal with WCM during each stage. The first stage deals with the global recession of 2008 and thereafter. The second involves managing working capital during the pandemic; thirdly during extreme change; and fourthly post-pandemic. It concludes with managing working capital in the new economic order. Samples of research outputs for each stage were used for critical analysis through a systematic analysis process. The results show that research into WCM after the 2008 global recession mostly focused on how businesses could mitigate the impact of the crisis itself and buffer themselves against future crises. During pandemics, there are three key steps that should be considered by management teams who seek to stabilise their cash positions. When experiencing extreme changes, such as economic downturns and sudden demand or supply shocks, businesses need to cushion them. Post pandemic working capital research focus is on demand volatility and workforce safety. Finally, in a new economic order, digital transformation shifts as well as effective cash management necessary to alleviate volatile supply chains, are important. The global coronavirus pandemic has produced a humanitarian crisis unlike anything before, with sudden and dramatic disruptions across all industries and markets. This research produces some insight into how to manage the short-term finances of a business during these phases.

Aarron Toal

Research Associate, Durham University, UK

Examining the Country-of-Origin Effect through the Lens of Evolutionary Psychology

Common theoretical, contextual, and methodological approaches towards investigating the country-of-origin effect, being the nationality bias of consumers, are built upon the foundations of and explained via, group-based behavioural dynamics and the assumed interrelationships between ingroups and outgroups. More specifically, consumer traits are organised through group-based sociological, psychological, or demographic associations, influences, and beliefs within the context of investigations, whilst traditional methodologies seek to explicitly position and compare home country brands and products to foreign alternatives. What results are proximate explanations describing how group-based consumer affiliations influence evaluations and purchasing behaviour towards products from the ingroup home country compared to outgroup foreign alternatives.

Such proximate explanations generally recognise that consumers affiliated with the ingroup will generate positive ingroup purchasing behaviour of home country products, and consequently respond less favourably to the outgroup and reject foreign product alternatives during comparative experiments. As a result, the prevailing approach to the study of the country-of-origin effect and its rationalisations, grounded within social constructionism, assumes that positive ingroup and negative outgroup motivations are mutually related. However, ingroup positivity verses outgroup negativity are not necessarily direct opposites on one behavioural bias continuum, but independent facets of behaviour. A developing body of evidence pertaining to the disciplines of evolutionary psychology and neuroscience suggest that intergroup biases do not assume automatic competitiveness between groups nor result in outgroup prejudices, and are the result of complex, evolved biological mechanisms within the brain.

Yet many country-of-origin investigations are structured to explicitly contextualise ingroups and outgroups, and resulting behaviours, as opposing concepts. Methodologies are built upon such comparisons and often circumvent the separation of group-affiliated evaluation metrics during experiments when seeking to demonstrate such consumer intergroup biases. This application of intergroup behavioural dynamics within country-of-origin studies has contributed to a large body of literature providing inconsistent results regarding the

strength and influence of the effect, with a general competency of explaining a positive bias towards home country products but difficulty in providing explanations of a negative bias against foreign alternatives.

To understand the nationality bias of consumers first requires a better understanding of the evolutionary functions and adaptations that group-based behavioural dynamics serve in such intergroup decision-making scenarios, and to then apply such understandings within experiment design that allow the distinct motivations of ingroup and outgroup behaviours to be examined. We begin with a discussion of ingroup/outgroup behavioural dynamics from a social constructionist viewpoint, before reviewing a largely overlooked body of literature of such dynamics pertaining to evolutionary theory and neuroscience.

We conclude that the reciprocal ingroup verses outgroup dichotomy is an ineffective approach to position such investigations and highlight previous inconsistencies within research studies that may be a result of such perspectives. We then explore alternate theoretical, contextual, and methodological approaches, grounded within evolutionary psychology and neuroscience, of investigating the country-of-origin effect.

Chia-Hao Tsai

Graduate Student, National Chunghua University of Education,
Taiwan

&

Erh-Tsung Chin

Associate Professor, National Chunghua University of Education,
Taiwan

Pupil's Fraction Learning based on Board Game Playing

Mathematics is considered as the subject most difficult to understand for primary school students in Taiwan. Pupils would think mathematics is a boring and non-meaningful subject if the teacher always stresses arithmetic rules and constant practice, which makes mathematics learning just the skills for understanding and training of calculation, but not for the abilities of problems solving. Therefore, the researchers try to integrate the preliminary concept of fraction learning into the board game designing. The students participating in the board game will play the role of magicians and use mathematical magic spells to attack in a specific for establishing the sense of fraction and related numeracy. The board game about fraction is applied to students from grade one to grade six (approximately ages 7 to 12 years old). Some questions are exploited with interviews to analyse the players' dispositions. The results show that most students possess productive dispositions toward playing this board game. Even if they have not learned fraction, they can still participate in the game together and use correct fraction vocabulary to communicate with others during the game. This research study has made some discoveries about the game-based learning instructional design, and it has also produced some limitations worthy of further research.

Tim Young

Professor, University of Tennessee at Knoxville, USA

&

Ampalavanar Nanthakumar

Professor, State University of New York at Oswego, USA

'Copula' Based Quality Control Charts in the Presence of Positive Autocorrelation

Advanced manufacturing for a multitude of continuous processing applications in the era of automation and 'Industry 4.0' is focused on rapid throughput with products of acceptable quality to customer specifications. Monitoring the stability and statistical control of key process parameters using data acquired from online sensors is fundamental to manufacturing automation. This study addresses the significant problem of positive autocorrelation in data collected from online sensors which may impair assessment of statistical control. Sensor data collected at short time intervals typically have significant autocorrelation and traditional statistical process control (SPC) techniques cannot be deployed. There is a plethora of literature on techniques for SPC in the presence of positive autocorrelation. This paper is unique and contributes to the literature by investigating the performance of a 'Copula' based control charts by assessing the average run length (ARL) when the subsequent observations are correlated and follow the AR(1) model. The conditional distribution of y_t given y_{t-1} is used in deriving the control chart limits for three different types of Copulas: Gaussian, Clayton, and Farli-Gumbel-Morgenstern Copulas. Preliminary results suggest that the overall performance of the Clayton Copula and Farli-Gumbel-Morgenstern Copula are better compared to other Archimedean Copulas. The Clayton Copula is the more robust with respect to changes in the process standard deviation as the correlation coefficient increases.

Wanting Zhao

PhD Student, Shanghai International Studies University, China

&

Zheng Fan

Professor Shanghai International Studies University, China

Analysis on the Differences of the Main Global Epidemic Fighting Models - Based on the Deep Research of Glacial Model

The COVID-19 epidemic in late 2019 and early 2020 has spread worldwide. The international community is facing challenges from life security, economy, politics and society. In the context of global epidemic fighting, anti-epidemic strategies and effects of various countries are quite different. So far, the most typical three models include: the Chinese model characterized by strong management and strict guard; the British and American model characterized by the survival of the fittest and respective responsibility burden; the Japan and South Korea model with precise control and economic non-stagnation. Important political, economic, social and cultural codes can be explored in these different models. This article focuses on three countries that have been fighting the epidemic: China, the United States and South Korea. From a cross-cultural perspective, this paper uses "glacier model" (The glacier model based on the "onion model", "Lotus model" and "iceberg model" is proposed to describe the civilized environment on which a management model depends and a new analytical framework based on institutional civilization) to explore the important three aspects: the national control system in the "snow layer" containing the structural characteristics of the national political system and economic system; the normalization system in the "frozen layer" including values, such as consciousness, thought and moral limits; the cultural cognitive system in "river layer" including the philosophical basis of civilization thought formation and the basic assumption of world cognition. Through comparative analysis of the above differences, this paper proposes three different epidemic fighting models in order to achieve a real sense of cross-cultural understanding, communication and cooperation. They are the Global standardized epidemic fighting model which is formed basing on sum-ups of the same and successful anti-epidemic methods via mutual leaning from different countries; the localized epidemic fighting model formed respectively according to countries comfits and contradictions; the Global localized epidemic fighting model characterized by unique

strategies which are suitable for one's domestic social conditions while integrating the successful local anti-epidemic modes with local, political, economic and cultural characteristics of its own country.