Book of the Short Papers

Editors: Francesco Maria Chelli, Mariateresa Ciommi, Salvatore Ingrassia, Francesca Mariani, Maria Cristina Recchioni

SIS Società Italiana di Statistica

UNIVERSITÀ POLITECNICA DELLE MARCHE

Dipartimento di Scienze Economiche e Sociali DISES

LIUC Università Cattaneo

LIUC Università Cattaneo | BUSINESS ANALYTICS AND DATA SCIENCE HUB

Pearson

CHAIRS

Salvatore Ingrassia (Chair of the Program Committee) - *Università degli Studi di Catania*
Maria Cristina Recchioni (Chair of the Local Organizing Committee) - *Università Politecnica delle Marche*

PROGRAM COMMITTEE

Salvatore Ingrassia (Chair), Elena Ambrosetti, Antonio Balzanella, Matilde Bini, Annalisa Busetta, Fabio Centofanti, Francesco M. Chelli, Simone Di Zio, Sabrina Giordano, Rosaria Ignaccolo, Filomena Maggino, Stefania Mignani, Lucia Paci, Monica Palma, Emilia Rocco.

LOCAL ORGANIZING COMMITTEE

Maria Cristina Recchioni (Chair), Chiara Capogrossi, Mariateresa Ciommi, Barbara Ermini, Chiara Gigliarano, Riccardo Lucchetti, Francesca Mariani, Gloria Polinesi, Giuseppe Ricciardo Lamonica, Barbara Zagaglia.

ORGANIZERS OF INVITED SESSIONS

Pierfrancesco Alaimo Di Loro, Laura Anderlucci, Luigi Augugliaro, Ilaria Benedetti, Rossella Berni, Mario Bolzan, Silvia Cagnone, Michela Cameletti, Federico Camerlenghi, Gabriella Campolo, Christian Capezza, Carlo Cavicchia, Mariateresa Ciommi, Guido Consonni, Giuseppe Ricciardo Lamonica, Regina Liu, Daniela Marella, Francesca Mariani, Matteo Mazziotta, Stefano Mazzuco, Raya Muttarak, Livia Elisa Ortensi, Edoardo Otranto, Ilaria Prosdocimi, Pasquale Sarnacchiaro, Manuela Stranges, Claudia Tarantola, Isabella Sulis, Roberta Varriale, Rosanna Verde.

FURTHER PEPOPLE OF LOCAL ORGANIZING COMMITTEE

Elisa D'Adamo, Christian Ferretti, Giada Gabbianelli, Elvina Merkaj, Luca Pedini, Alessandro Pionati, Marco Tedeschi, Francesco Valentini, Rostand Arland Yebetchou Tchounkeu

Technical support: Matteo Mercuri, Maila Ragni, Daniele Ripanti

Copyright © 2023
PUBLISHED BY PEARSON
WWW.PEARSON.COM
ISBN 9788891935618AAVV

Contents

Preface **XXII**

1 Plenary Sessions **1**

Inequality indices: accurate simulation-based inference 2
Maria-Pia Victoria-Feser

Examples from the Interface of Neural Models and Spatio-Temporal Statistics in Environmental Applications 7
Christopher K. Wikle, Likun Zhang, Myungsoo Yoo and Xiaoyu Ma

Demographic change and sustainability: novel approaches from digital and computational demography n.a.
Emilio Zagheni

2 Invited Sessions **14**

Machine learning in the design, analysis and integration of sample surveys

Causal Discovery for complex survey data 15
Paola Vicard

Data Integration without conditional independence: a Bayesian Networks approach 21
Pier Luigi Conti, Paola Vicard and Vincenzina Vitale

Mass imputation through Machine Learning techniques in presence of multi-source data 27
Fabrizio De Fausti, Marco Di Zio, Romina Filippini and Simona Toti

Machine learning: different uses and perspectives

Evaluation of pollution containment policies in the US and the role of machine learning algorithms 32
Marco Di Cataldo, Margherita Gerolimetto, Stefano Magrini and Alessandro Spiganti

Machine Learning for Official Statistics: An Application on External Trade n.a.
Mauro Bruno, Maria Serena Causo, Alessio Guandalini, Francesco Ortame and Silvia Russo
Machine learning, data quality and official statistics: challenges and opportunities n.a.
Stefano Menghinello

Statistical Machine Learning for environmental applications

Gaussian Processes and Deep Neural Networks for Spatial Prediction 38
Alex Cucco, Luigi Ippoliti, Nicola Pronello, Pasquale Valentini and Carlo Zaccardi
How can we explain Random Forests in a spatial framework? 42
Natalia Golini, Luca Patelli and Xavier Barber
Recent approaches in coupling deep learning methods with the statistical analysis of spatial point patterns 48
Jorge Mateu and Abdollah Jalilian

Statistical Process Monitoring for Complex Data in Industry 4.0

A Kernel-based Nonparametric Multivariate CUSUM for Location Shifts 53
Konstantinos Bourazas, Konstantinos Fokianos, Christos Panayiotou and Marios Polycarpou
An Approach for Profile Monitoring via Mixture Regression Models 58
Davide Forcina, Antonio Lepore and Biagio Palumbo
Anomaly Detection in Circular Data 63
Houyem Demni and Giovanni C. Porzio

Advances in Data Science and Statistical Learning [IMS Invited Session]

Empirical Bayes approximation of Bayesian learning: understanding a common practice n.a.
Sonia Petrone
Generalized Fiducial Inference on Differentiable Manifolds - a geometric perspective n.a.
Jan Hannig
Model-free bootstrap and conformal prediction in regression n.a.
Dimitris Politis

ENBIS Session: System Maintenance, Boosting algorithms for regression, and Research Excellence

Boosting Diversity in Regression Ensembles 69
Mathias Bourel, Jairo Cugliari, Yannig Goude and Jean-Michel Poggi
How ENBIS has contributed to the UK Universities Research Excellence Framework 71
Shirley Coleman
Maintenance of degrading systems by dynamic programming or reinforcement learning 75
Antonio Pievatolo

Population Dynamics, Climate Change and Sustainability

Climate change impacts on fertility in low- and middle-income countries: An analysis based on global sub-national data n.a.
Côme Cheritel, Roman Hoffmann and Raya Muttarak

Environmental Exposures and Under-5 Mortality in India: A Survival Analysis of DHS data 79
Vinod Joseph Kannankeril Joseph

The impact of temperature on expressed sentiment by migration status: Evidence from geo-located Twitter data 84
Risto Conte Keivabu and Jisu Kim

Statistical Learning for health research and omics data

An alternative to the Dirichlet-multinomial regression model for microbiome data analysis 95
Roberto Ascari, Sonia Migliorati and Andrea Ongaro

Modelling ordinal response to treatment in a real-world cohort study 101
Marco Alfò, Maria Francesca Marino and Silvia D'Elia

On the application of the symmetric graphical lasso for paired data 105
Saverio Ranciati and Alberto Roverato

The Economic behaviour of Sustainability

Airports performances and sustainable practices. An empirical study on Italian data 110
Riccardo Gianluigi Serio, Maria Michela Dickson, Diego Giuliani and Giuseppe Espa

Sustainability: still an undefined concept for Italians 116
Raffaele Angelone and Andrea Marletta

Quasi-experimental evidence on COVID-19 lockdown effects on Italian household food shopping basket composition and its sustainability 122
Beatrice Biondi and Mario Mazzocchi

Advances in statistical methods for complex problems

Inferring multiple treatment effects from observational studies using confounder importance learning n.a.
Omiros Papaspiliopoulos

Path analysis in Ising models: an application to cyber-security risk assessment 127
Monia Lupparelli and Giovanni M. Marchetti

Causal Regularization n.a.
Lucas Kania and Ernst Wit

Explainable machine learning models

Enhancing Markowitz model: inspection of correlations and tail covariances 133
Gloria Polinesi

Objective and subjective dimension of economic well-being: an approach based on statistical matching 139
Daniela Marella, Vincenzina Vitale and Pierpaolo D'Urso

Sustainable, Accurate, Fair and Explainable Machine Learning Models n.a.
Paolo Giudici and Emanuela Raffinetti

Flexible Learning for Environmental Sustainability

Comparison of traffic flow data sources for air pollution modelling 145
Theresa Smith and Nick McCullen

Data analysis of photogrammetry-based mapping: the sea cucumbers in the Giglio Island as a case-study 150
Gianluca Mastrantonio, Daniele Ventura, Edoardo Casoli, Arnold Rakaj, Giovanna Jona Lasinio and Alessio Pollice

Understanding forest damage in Germany: Finding key drivers to help with future forest conversion of climate sensitive 156
Nicole Augustin, Heike Puhlmann and Simon Trust

Inequalities in higher education outcomes: learning from data

Inequalities in international students mobility 163
Kristijan Breznik, Giancarlo Ragozini and Marialuisa Restaino

Uncovering the interplay of territorial, socioeconomic, and demographic factors in high school to university transition 169
Vincenzo Giuseppe Genova, Andrea Priulla and Martina Vittorietti

Statistical Learning of demographic and health dynamics

Estimating the impact of a vaccine mandate: the case of measles in Italy n.a.
Chiara Chiavenna

Leveraging deep neural networks to estimate age-specific mortality from life expectancy at birth n.a.
Andrea Nigri

Nowcasting Daily Population Displacement in Ukraine through Social Media Advertising Data n.a.
Claire Dooley, Ridhi Kashyap, Douglas Leasure and Francesco Rampazzo

Challenges towards Fairness and Transparency for Data Processes, Algorithms and Decision-Support Models

Challenges on Ethics, and Privacy in AI Applications to Fintech 175
Catarina Silva, Joana Matos Dias and Bernardete Ribeiro

Uncertainty and fairness metrics 180
Anna Gottard

Educational Data mining: methods for complex data in students' assessment

Analysis of University Grades: An IRT Model for Responses and Response Times with Censoring 186
Michela Battauz

Predicting high schools' students performances with registry's data: a machine learning approach 191
Lidia Rossi, Marta Cannistrà and Tommaso Agasisti

Using response times to identify cheaters in CAT: A simulation study 195
Luca Bungaro, Bernard P. Veldkamp and Mariagiulia Matteucci

Spatial and Spatio-Temporal Modeling: Theory and Applications

A geostatistical investigation of the ammonia-livestock relationship in the Po Valley, Italy 200
Paolo Maranzano, Kelly McConville , Philipp Otto and Felicetta Carillo

Bayesian multi-species N-mixture models for large scale spatial data in community ecology 206
Michele Peruzzi

Minimum contrast for point processes' first-order intensity estimation 212
Nicoletta D'Angelo and Giada Adelfio

Statistical Framework for Measuring the Sustainability of Tourism

Data validity and statistical conformity with Benford's Law: the case of tourism in Sicily 217
Roy Cerqueti and Davide Provenzano

Exploring the level of digitalization of the Italian museums through a multilevel ordered logit model 228
Claudia Cappello, Sabrina Maggio and Sandra De Iaco

Functional Partial Least-Squares via Regression Splines. An application on Italian Sustainable Development Goals data 232
Ida Camminatiello, Rosaria Lombardo, Jean-Francois Durand and Leonardo S. Alaimo

Statistical learning for well-being analysis

Assessing multidimensional poverty of the Italian provinces during Covid-19: a small area estimation approach 238
Mariateresa Ciommi, Chiara Gigliarano, Francesca Mariani and Gloria Polinesi

The fuzzy set approach as statistical learning for the analysis of multidimensional well-being 244
Gianni Betti, Federico Crescenzi, Antonella D'Agostino and Laura Neri

What Makes a Satisfying Life? Prediction and Interpretation with Machine-Learning Algorithms n.a.
Conchita D'Ambrosio

Bayesian contributions to Statistical Learning

A Bayesian framework for early cancer screening 249
Sally Paganin and Jeff Miller

Imputing Synthetic Pseudo Data from Aggregate Data: Development and Validation for Precision Medicine n.a.
Cecilia Balocchi

Linear models with assumptions-free residuals: a Bayesian Nonparametric approach 254
Filippo Ascolani and Valentina Ghidini

Data Visualization for Smart Insights and Advanced Predictive Analytics

Applications of data visualization for industry 259
Martina Dossi, Stefano Sangaletti, Marilena Di Bari and Federica Bruschini

Some Notes on the Use of the Circular Boxplot n.a.
Giovanni Camillo Porzio and Davide Buttarazzi

TERRA: a smart visualization tool for international trade in goods statistics 265
Francesco Amato, Mauro Bruno and Maria Serena Causo

Methods for the analysis of distributional data

Clustering of Distributional Data based on LDQ transformation 271
Gianmarco Borrata and Rosanna Verde

Dynamic learning from data streams through the combined use of probability density functions and simplicial functional principal component analysis 276
Francesca Fortuna, Fabrizio Maturo and Tonio Di Battista

Multivariate Parametric Analysis of Distributional Data n.a.
Paula Brito

Migrants and Refugees in Europe: social, economic and health-related issues

Labor Market Return to Refugees' Human Capital Investment: A Natural Experiment in Sweden n.a.
Eleonora Mussino

Social networks and loneliness among older migrants in Italy 282
Viviana Amati, Eralba Cela and Elisa Barbiano di Belgiojoso

The Italian Decree on Security: An Analysis of the Impact on Asylum Applications 287
Giorgio Piccitto

Modelling and Forecasting High-dimensional time series

Adaptive combinations of tail-risk forecasts 293
Alessandra Amendola, Vincenzo Candila, Antonio Naimoli and Giuseppe Storti

Are Monetary Policy Announcements related to Volatility Jumps? 299
Giampiero Gallo, Demetrio Lacava and Edoardo Otranto

Regularized Estimation and Prediction of the El Nino/Southern Oscillation Cycle n.a.
Alessandro Giovannelli and Tommaso Proietti

3 Contributed Sessions 305

Bayesian nonparametric methods

Bayesian density estimation for modeling age-at-death distribution 306
Davide Agnoletto, Tommaso Rigon and Bruno Scarpa

Bayesian mixing distribution estimation in the Gaussian-smoothed 1-Wasserstein distance 311
Catia Scricciolo

Bayesian nonparametric estimation of heterogeneous intrinsic dimension via product partition models 316
Francesco Denti, Antonio Di Noia and Antonietta Mira

Bayesian nonparametric multiple change point detection for time series of compositional data 322
Edoardo Marchionni and Riccardo Corradin

Galton-Watson process: a non parametric prior for the offspring distribution 328
Massimo Cannas, Michele Guindani and Nicola Piras

Hierarchical processes in survival analysis 333
Riccardo Cogo, Federico Camerlenghi and Tommaso Rigon

Economics and Statistics

A regression analysis for count data to investigate the effectiveness of incentives on the adoption of 4.0 technologies 339
Stefano Bonnini and Michela Borghesi

Statistical analysis on SDGs indicators related to environmental sustainability 344
Najada Firza, Anisa Bakiu and Dante Mazzitelli

Empowering futures adopting a spatial convergence of opinions: a Real-Time Spatial Delphi approach 349
Yuri Calleo, Simone Di Zio and Francesco Pilla

Stocks price forecasts using Stochastic Differential Equations: an empirical assessment 355
Dario Frisardi and Matteo Spuri

The Added-Worker Effect within Italian Households 361
Donata Favaro and Anna Giraldo

Health statistics 1

A model for the natural history of breast cancer: application to a Norwegian screening dataset 365
Laura Bondi, Marco Bonetti and Solveig Hofvind

Generalized Bayesian Ensemble Survival Trees: an extension to categorical variables to apply it to real data 370
Elena Ballante

Joint modelling of hospitalizations and survival in Heart Failure patients: a discrete non parametric frailty approach 375
Chiara Masci, Marta Spreafico and Francesca Ieva

Mobility trends in Italy during the first wave of Covid-19 pandemic: analysis on Google data 381
Ilaria Bombelli and Daniele De Rocchi

Tracking attitudes towards COVID vaccines: A text mining analysis 387
Leonardo Scarso, Marco Novelli and Francesco Saverio Violante

Treatment effect assessment in observational studies with multi-level treatment and outcome 393
Federica Cugnata, Paola Vicard, Paola M.V. Rancoita, Fulvia Mecatti, Clelia Di Serio and Pier Luigi Conti

Indicators: composition, uses and limitations

Are European consumers willing to pay the true price for sustainable food? 399
Luca Secondi and Mengting Yu

Can the reliability of composite indexes be impacted by uncertainty of individual indicators? 406
Caterina Giusti, Stefano Marchetti and Vincenzo Mauro

Initial Coin Offerings and ESG: allies or enemies? 411
Alessandro Bitetto and Paola Cerchiello

On the impact of intraclass correlation in the ANVUR evaluation of academic departments 417
Giorgio Edoardo Montanari and Marco Doretti

Small area estimation of monetary poverty indicators with poverty lines adjusted using local price indexes 422
Luigi Biggeri, Stefano Marchetti, Caterina Giusti, Monica Pratesi, Francesco Schirripa Spagnolo and Gaia Bertarelli

Smart Composite Indicators Measuring Corporate Sustainability: A Sensitivity Analysis 428
Camilla Salvatore, Annamaria Bianchi and Silvia Biffignandi

Multivariate data analysis 1

A note on most powerful tests for right censored survival data 434
Maria Veronica Vinattieri and Marco Bonetti

Enhancing Principal Components by a Linear Predictor: an Application to Well-Being Italian Data 439
Laura Marcis, Maria Chiara Pagliarella and Renato Salvatore

Proper Bayesian Bootstrap for Bagging tree model in survival analysis with correlated data 445
Farah Naz and Elena Ballante

ROBOUT: a multi-step methodology for conditional outlier detection 450
Matteo Farnè and Angelos Vouldis

Robustness of the Efficient Covariate-Adaptive Design for balancing covariates in comparative experiments 456
Rosamarie Frieri, Alessandro Baldi Antognini, Maroussa Zagoraiou, and Marco Novelli

Separation scores: a new statistical tool for scoring and ranking partially ordered data 462
Marco Fattore

Statistics in Society 1

Community detection analysis with robin on hashtag network 468
Valeria Policastro, Francesco Santelli and Giancarlo Ragozini

Film Tourism Motivation through the lens of Trip Advisor data 474
Nicolò Biasetton, Marta Disegna, Girish Prayag and Elena Barzizza

Life satisfaction and social activities in later life in Italy: a focus on the Internet use 480
Claudia Furlan and Silvia Meggiolaro

Social capital endowment's role in the intergenerational transmission of education 485
Alessandra Trimarchi, Maria Gabriella Campolo and Antonino Di Pino Incognito

Streaming Data from Social Networks to Track Political Trends 490
Emiliano del Gobbo and Barbara Cafarelli

The scientific production on gender dysphoria: a bibliometric analysis 495
Maria Gabriella Grassia, Marina Marino, Massimo Aria, Rocco Mazza, Luca D'Aniello and Agostino Stavolo

Assessment and Education

A hierarchical modelling approach to explain differential functioning of mathematics items by student's gender 500
Clelia Cascella

A latent variable approach to Millennials' knowledge of green finance 506
Maria Iannario, Alessandra Tanda and Claudia Tarantola

Archetypal analysis and latent Markov models: A step-wise approach 512
Lucio Palazzo, Rosa Fabbricatore and Francesco Palumbo

From high school to university: academic intentions and enrolment of foreign students in Italy 518
Francesca Di Patrizio, Eleonora Trappolini and Cristina Giudici

Growth models for the progress test in Italian dentistry degree program 523
Giulio Biscardi, Leonardo Grilli, Carla Rampichini, Laura Antonucci and Corrado Crocetta

The COVID-19 pandemic and academic E-learning: Italian students and instructors' perceptions 527
Francesco Santelli, Teresa Gentile, Davide Bizjak and Lorenzo Fattori

Working Students and job market outcomes: Insights from the University of Florence 532
Gabriele Lombardi, Valentina Tocchioni and Alessandra Petrucci

Bayesian methods and applications 1

Analyzing RNA data with scVelo: identifiability issues and a Bayesian implementation 538
Elena Sabbioni, Enrico Bibbona, Gianluca Mastrantonio and Guido Sanguinetti

Approximate Bayesian Computation for Probabilistic Damage Identification 544
Cecilia Viscardi, Silvia Monchetti, Luisa Collodi, Gianni Bartoli, Michele Betti, Michele Boreale and Fabio Corradi

Estimation of scientific productivity with a hierarchical Bayesian model 550
Maura Mezzetti and Ilia Negri

Heat waves and free-knots splines 555
Gioia Di Credico and Francesco Pauli

The Hierarchical Beta-Bernoulli Process as Out-of-Scope Query Detector 560
Marco Dalla Pria and Silvia Montagna

Health and mortality

A novel definition of comorbidity based on the Global Burden of Diseases project weights 566
Angela Andreella, Lorenzo Monasta and Stefano Campostrini

An Age-Period-Cohort model of gender gap in youth mortality 572
Giacomo Lanfiuti Baldi and Andrea Nigri

Kinlessness in adult and old age across Europe 578
Marta Pittavino, Bruno Arpino and Elena Pirani

Parameter orthogonalization for Siler mortality model 584
Claudia Di Caterina and Lucia Zanotto

Pseudo-observations in survival analysis 590
Marta Cipriani, Alfonso Piciocchi, Valentina Arena and Marco Alfò

Sex Gap in Cancer-Free Life Expectancy: The Association with Smoking, Obesity and Physical Inactivity 595
Alessandro Feraldi, Cristina Giudici and Nicolas Brouard

Women's Exposure to HIV in Africa: the Role of Intimate Partner Violence 599
Micaela Arcaio and Anna Maria Parroco

Mixture Models

An extension of finite mixtures of latent trait analyzers for biclustering bipartite networks 605
Dalila Failli, Maria Francesca Marino and Francesca Martella

Constrained Mixtures of Generalized Normal Distributions 611
Pierdomenico Duttilo, Alfred Kume and Stefano Antonio Gattone

Mixture-based clustering with covariates for ordinal responses 617
Kemmawadee Preedalikit, Daniel Fernàndez, Ivy Liuc, Louise McMillan, Marta Nai Ruscone and Roy Costilla

Partial membership models for soft clustering of multivariate count data 623
Emiliano Seri, Thomas Brendan Murphy and Roberto Rocci

Regression for mixture models for extremes 629
Viviana Carcaiso, Ilaria Prosdocimi and Isadora Antoniano-Villalobos

Robust matrix-variate mixtures of regressions 635
Salvatore Daniele Tomarchio and Michael P. B. Gallaugher

Sampling methods and analysis of survey data

On the use of auxiliary information to define the sampling design for large-scale geospatial data 641
Chiara Bocci and Emilia Rocco

Optimal joint inclusion probabilities for spatial sampling n.a.
Giuseppe Arbia, Piero Demetrio Falorsi and Vincenzo Nardelli

Robustness and Balance of Sampling or Experimental Designs and Mixture of Designs 647
Yves Tillé and Ejub Talovic

Robustness Bounds for Sampling and Experimental Designs 654
Ejub Talovic and Yves Tillé

Statistical Matching: Hotdeck or Propensity Score? 661
Elena Dalla Chiara, Marcello D'Orazio and Federico Perali

The Italian experience on register-based statistics considering measurement, coverage and sampling errors 667
Marco Di Zio, Romina Filippini and Simona Toti

Space-time statistics

A Hierarchical Spatio-Temporal Model for Time-Frequency Data: An application in bioacoustic analysis 673
Hiu Ching Yip, Gianluca Mastrantonio, Enrico Bibbona, Daria Valente and Marco Gamba

An approach to cluster time series extremes with spatial constraints 679
Alessia Benevento, Fabrizio Durante and Roberta Pappadà

An integrated space-time model to evaluate the innovation drivers in Italy 685
Emma Bruno, Rosalia Castellano and Gennaro Punzo

Revealing the dynamic relations between traffic and crowding using big data from mobile phone network 691
Selene Perazzini, Rodolfo Metulini and Maurizio Carpita

SMaC: Spatial Matrix Completion method 697
Giulio Grossi, Alessandra Mattei and Georgia Papadogeorgou

The impact of traffic flow and road signs on road accidents: an approach based on spatiotemporal point pattern analysis on linear networks 702
Andrea Gilardi and Riccardo Borgoni

Clustering and classification 1

A clustering model for flow data: an application to international student mobility 708
Cinzia Di Nuzzo and Donatella Vicari

Contingency tables with structural zeros and discrete copulas 713
Roberto Fontana, Elisa Perrone and Fabio Rapallo

Levels Merging in the Latent Class Model 719
Christophe Biernacki

Model-based clustering of count processes with multiple change 725
Shuchismita Sarkar and Xuwen Zhu

Similarity Measures and Internal Evaluation Criteria in Hierarchical Clustering of Categorical Data 729
Jana Cibulková, Zdeněk Šulc, Hana Řezanková and Jaroslav Horníček

Spectral clustering of mixed data via association-based distance 735
Alfonso Iodice D'Enza, Francesco Palumbo and Cristina Tortora

Dynamic models and time series

A graph based convolution Neural Network approach for forecast reconciliation 741
Andrea Marcocchia and Pierpaolo Brutti

A multivariate hidden semi-Markov model for the analysis of multiple air pollutants 747
Marco Mingione, Pierfrancesco Alaimo Di Loro, Francesco Lagona and Antonello Maruotti

A smooth transition autoregressive model for matrix-variate time series 753
Andrea Bucci

Dynamic network models with time-varying nodes 759
Luca Gherardini, Mauro Bernardi and Monia Lupparelli

Time lapse analysis of nuclear calcium spiking in plant cells during symbiotic signaling 765
Ivan Sciascia, Andrea Crosino and Andrea Genre

Two-stage weighted least squares estimator of multivariate conditional mean observation-driven time series models 770
Mirko Armillotta

Environmental learning and indicators

Assessing the performance of nuclear norm-based matrix completion methods on CO_2 emissions data 776
Rodolfo Metulini, Francesco Biancalani, Giorgio Gnecco and Massimo Riccaboni

Deep Learning for smart and sustainable agriculture 782
Amalia Vanacore, Armando Ciardiello, Annalisa Izzo, Pierdomenico Zaffino, Carolina Vecchio, Gennaro Pio Auricchio and Luigi Uccelli

Do green transition, environmental taxes and renew-able energy promote ecological sustainability in G7 countries? Evidence from panel quantile regression 788
Aamir Javed, Agnese Rapposelli and Asif Javed

Doubly Robust DID for National Parks evaluation: "just" environmental benefits, or socioeconomics impacts as well? 795
Riccardo D'Alberto, Francesco Pagliacci and Matteo Zavalloni

On the gap between emitted and absorbed carbon dioxide. Are trees enough to save us? 801
Lorenzo Mori and Maria Rosaria Ferrante

Small scale analysis of energy vulnerability in the municipality of Palermo 806
Giuliana La Mantia

Health statistics 2

A test for non-differential misclassification error in database epidemiological studies 812
Giorgio Limoncella, Leonardo Grilli, Emanuela Dreassi, Carla Rampichini, Robert Platt and Rosa Gini

Is the COVID-19 'color code' of Italian regions subjected to political manipulation? 816
Giovanni Busetta and Fabio Fiorillo

Modelling multilevel ordinal response under endogeneity: application to DTC patients' outcome 822
Silvia D'Elia

Monitoring drugs-based diagnostic therapeutic paths in heart failure patients using state-sequence analysis techniques 827
Nicole Fontana, Laura Savaré and Francesca Ieva

Optimal two-stage design based on error rates under a Bayesian perspective 833
Susanna Gentile and Valeria Sambucini

Migrants in Italy and return migration

Comparing migrant and "native" Italian adolescents in risky behaviours 1315
Daniela Foresta, Elena Ambrosetti, Sergi Trias-Llimos and Pilar Zuares

EU-Border crisis on Twitter: sentiments and misinformation analysis 839
Elena Ambrosetti, Cecilia Fortunato and Sara Miccoli

Graduates' interregional migration in times of crisis: the Italian case 843
Thaís García-Pereiro, Ivano Dileo and Anna Paterno

Intentions to stay: The experience of return migrants in Albania 848
Maria Carella, Thaís García-Pereiro, Roberta Pace and Anna Paterno

Return migration to home country: a systematic literature review with text mining and topic modelling 853
Cecilia Fortunato, Andrea Iacobucci and Elena Ambrosetti

The allocation of time within native and foreign couples living in Italy 860
Giovanni Busetta, Maria Gabriella Campolo and Antonino Di Pino Incognito

Εἰλείθυια comes from afar: The foreigners' contribution to fertility by Italian provinces 866
Eleonora Miaci, Cristina Giudici, Eleonora Trappolini, Marina Attili, Cinzia Castagnaro and Antonella Guarneri

Sustainability assessment

ESG, sustainability and stock market risk 871
Michele Costa

Exploring the effect of consumer motivation and perception of sustainability on food choices with a Discrete Choice Experiment 875
Gloria Solano-Hermosilla, Jesus Barreiro-Hurle and Ilaria Amerise

Sustainability explained by ChatGPT artificial intelligence in a HITL perspective: innovative approaches 881
Vito Santarcangelo, Angelo Lamacchia, Emilio Massa, Saverio Gianluca Crisafulli, Massimiliano Giacalone and Vincenzo Basile

Measuring economic and ecological efficiency of urban waste systems in Italy: a comparison of SFA and DEA techniques 887
Massimo Gastaldi, Ginevra Virginia Lombardi, Agnese Rapposelli and Giulia Romano

Profile based latent distance association analysis for sparse tables. Application to the attitude of EU citizens towards sustainable tourism 893
Francesca Bassi, Josè Fernando Vera and Juan Antonio Marmolejo Martìn

Sustainable tourism: a survey on the propensity towards eco-friendly accommodations 899
Claudia Furlan and Giovanni Finocchiaro

Bayesian methods and applications 2

A comparison of computational approaches for posterior inference in Bayesian Poisson regression 903
Laura D'Angelo

Bias-reduction methods for Poisson regression models 908
Luca Presicce, Tommaso Rigon and Emanuele Aliverti

Finite Mixture Model for Multiple Sample Data 913
Alessandro Colombi, Raffaele Argiento, Federico Camerlenghi and Lucia Paci

On Bayesian power analysis in reliability 918
Fulvio De Santis, Stefania Gubbiotti and Francesco Mariani

Power priors elicitation through Bayes factors 923
Roberto Macrì Demartino, Leonardo Egidi and Nicola Torelli

Predictive Bayes factors 929
Leonardo Egidi and Ioannis Ntzoufras

Clustering and classification 2

A Clusterwise Regression Method for Distributional-Valued Data 935
Antonio Balzanella, Rosanna Verde and Francisco de A.T. de Carvalho

A novel statistical-significance based semi-parametric GLMM for clustering countries standing on their innumeracy levels 939
Alessandra Ragni, Chiara Masci, Francesca Ieva and Anna Maria Paganoni

Introducing a novel directional distribution depth function for supervised classification 945
Edoardo Redivo and Cinzia Viroli

Clustering alternatives in the preference-approval context 950
Alessandro Albano, José Luis Garcia-Lapresta , Mariangela Sciandra and Antonella Plaia

Computational assessment of k-means clustering on a Structural Equation Model based index 955
Mariaelena Bottazzi Schenone, Elena Grimaccia and Maurizio Vichi

Handling missing data in complex phenomena: an ultrametric model-based approach for clustering 961
Francesca Greselin and Giorgia Zaccaria

Economics and labour markets

A multivariate ranking analysis on the employability of young adults 967
Rosa Arboretti, Elena Barzizza, Nicolo Biasetton, Riccardo Ceccato, Monica Fedeli and Concetta Tino

Analysis of the Gender Pay Gap in the Italian Labour Market 973
Giulia Cappelletti and Daniele Toninelli

Evaluating the effect of home-based working employing causal Bayesian networks and potential outcomes 979
Lorenzo Giammei

Patterns of flexible employment careers. Does measurement error matter? 985
Mauricio Garnier-Villarreal, Dimitris Pavlopoulos and Roberta Varriale

Staying or leaving? A nonlinear framework to explore the role of employee well-being on retention 991
Ulpiani Kocollari, Fabio Demaria and Maddalena Cavicchioli

The CAP instruments impact on GVA and employment: a multivalued treatment approach 997
Montezuma Dumangane and Marzia Freo

The determinants of leaving the parental home in Italy: 2012-18 1003
Ilaria Rocco and Gianpiero Dalla Zuanna

Environmental modeling

A Bayesian weather-driven spatio-temporal model for PM10 in Lombardy 1109
Michela Frigeri, Alessandra Guglielmi and Giovanni Lonati

A preliminary study on shape descriptors for the characterization of microplastics ingested by fish 1015
Greta Panunzi, Tommaso Valente, Marco Matiddi and Giovanna Jona Lasinio

Artificial neural network in predicting odour concentrations: a case study 1021
Veronica Distefano and Gideon Mazuruse

Bayesian analysis of PM10 concentration by spatio-temporal ARIMA and STS models 1026
Michela Frigeri and Ilenia Epifani

Functional ANOVA to monitor yearly Adriatic sea temperature variations 1032
Annalina Sarra, Adelia Evangelista, Tonio Di Battista and Nicola Di Deo

New perspectives in the measurement of biodiversity 1038
Linda Altieri, Daniela Cocchi and Massimo Ventrucci

Multivariate data analysis 2

Feature Selection via anomaly detection autoencoders in radiogenomics studies 1044
Alessia Mapelli, Michela Carlotta Massi, Nicola Rares Franco, Francesca Ieva, Catharine West, Petra Seibold, Jenny Chang-Claude and the REQUITE and RADprecise Consortia

Further considerations on the Spectral Information Criterion 1050
Luca Martino

How to increase the power of the test in sparse contingency tables: a simulation study 1057
Federica Nicolussi and Manuela Cazzaro

Latent event history models for quasi-reaction systems 1063
Matteo Framba, VeronicaVinciotti and Ernst Wit

Quantile-based graphical models for continuous and discrete variables 1069
Luca Merlo, Marco Geraci and Lea Petrella

The logratio Student t distribution 1075
Gianna Monti and Gloria Mateu-Figueras

Statistics in Society 2

A decomposition of the changes in tourism demand in Tuscany over the 2019-2021 period 1079
Mauro Mussini

Bayesian networks as a territorial gender impact assessment tool 1084
Flaminia Musella, Lorenzo Giammei, Fulvia Mecatti and Paola Vicar

Can statistics be helpful in detecting electoral fraud? 1088
Massimo Attanasio, Vincenzo G. Genova and Michele Tumminello

Companies' sustainability disclosure and contrast to hunger: the role of social inclusion 1093
Chiara Di Maria and Rodolfo Damiano

Passing network-based performance indicator in football: evidence from UEFA Champions League 2016-2017 1099
Riccardo Ievoli, Lucio Palazzo and Giancarlo Ragozini

Topic Modeling for the travel and tourism industry: classical and innovative methods compared 1105
Fabrizio Di Mari

Bayesian methods and applications 3

An Importance Sampling Algorithm For Bayesian Logistic Regression with Independent Gaussian Scale Mixture Prior 1111
Paolo Onorati and Brunero Liseo

Bayesian analysis of Amazon's best-selling books via finite nested mixture model 1117
Laura D'Angelo and Francesco Denti

Binomial Extended Stochastic Block Model for Brain Networks 1121
Valentina Ghidini, Sirio Legramanti and Raffaele Argiento

Detecting latent spatial patterns in mass spectrometry brain imaging data via Bayesian mixtures 1127
Giulia Capitoli, Simone Colombara, Alessia Cotroneo, Francesco De Caro, Riccardo Morandi, Chiara Schembri, Alfredo G. Zapiola and Francesco Denti

Efficient expectation propagation for high-dimensional probit models 1133
Augusto Fasano, Niccolo Anceschi, Beatrice Franzolini and Giovanni Rebaudo

Model-based clustering of non-stationary time series with common historical change times 1139
Riccardo Corradin, Luca Danese, Wasiur KhudaBukhsh and Andrea Ongaro

Functional Data Analysis

A functional Ground Motion Model for Italy built with a weighted analysis of reconstructed seismic curves 1145
Teresa Bortolotti, Riccardo Peli, Giovanni Lanzano, Sara Sgobba and Alessandra Menafoglio

Conditional Gaussian Graphical Models for Functional Variables whit Partial Separable Operators 1149
Rita Fici, Gianluca Sottile and Luigi Augugliaro

Does the Inflation Factor need tuning? Simulation-based adjustment for Outlier Detection via the Functional Boxplot 1155
Annachiara Rossi, Andrea Cappozzo and Francesca Ieva

Functional Graphical Models to map Brexit debate on Twitter 1160
Nicola Pronello, Emiliano del Gobbo, Lara Fontanella, Rosaria Ignaccolo, Luigi Ippoliti and Sara Fontanella

Measuring Dependence in Multivariate Functional Datasets 1166
Francesca Ieva, Michael Ronzulli and Anna Maria Paganoni

Robust Statistical Process Monitoring of Multivariate Functional Data 1173
Christian Capezza, Fabio Centofanti, Antonio Lepore and Biagio Palumbo

The effects of mobility restrictions on public health: a functional data analysis for Italy over the years 2020 and 2021 1179
Veronica Mazzola, Giovanni Bonaccorsi, Piercesare Secchi and Francesca Ieva

Machine Learning and text mining

A vocabulary-based approach for risk detection in textual annotations of contracts of public procurement 1185
Giulio Giacomo Cantone, Simone Del Sarto and Michela Gnaldi

Explainable Machine Learning based on Group Equivariant Non-Expansive Operators (GENEOs). Protein pocket detection: a case study 1191
Giovanni Bocchi, Alessandra Micheletti, Patrizio Frosini, Alessandro Pedretti, Andrea R. Beccari, Filippo Lunghini, Carmine Talarico and Carmen Gratteri

Hedging global currency risk with factorial machine learning models 1197
Paolo Pagnottoni and Alessandro Spelta

InstanceSHAP: An instance-based estimation approach for Shapley values 1203
Golnoosh Babaei and Paolo Giudici

Networks & Nature Based Solutions: an application for Milan hydric resources 1209
Alessia Forciniti and Emma Zavarrone

The Roe v. Wade sentence: an analysis of tweets trough Symmetric Non-Negative Matrix Factorization 1215
Maria Gabriella Grassia, Marina Marino, Rocco Mazza and Agostino Stavolo

Multivariate data analysis 3

A comparison of different techniques for handling missing covariate values in propensity score methods 1219
Anna Zanovello, Alessandra R. Brazzale and Omar Paccagnella

A New Penalized Estimator for Sparse Inference in Gaussian Graphical Models: An Adaptive Non-Convex Approach 1224
Daniele Cuntrera, Vito M.R. Muggeo and Luigi Augugliaro

A tool for assessing weak identifiability of statistical models 1230
Antonio Di Noia, Francesco Denti and Antonietta Mira

Computing Highest Density Regions with Copulae 1235
Nina Deliu and Brunero Liseo

Parameter estimation via Indirect Inference for multivariate Wrapped Normal distributions 1241
Francesca Labanca and Anna Gottard

Sequential marginal likelihood selection for the estimation of sparse correlation matrices 1246
Claudia Di Caterina and Davide Ferrari

Nonparametric statistical methods

A Comparison of Distribution-Free Control Charts 1252
Michele Scagliarini

Characterizing Heterogeneity of Causal Effects in Air Pollution in Florida 1257
Dafne Zorzetto

Comparing three robust procedures for CANDECOMP/PARAFAC estimation 1262
Valentin Todorov, Violetta Simonacci, Michele Gallo and Nikolay Trendafilov

How active is a genetic pathway? Comparative analysis of post-hoc permutation-based methods 1268
Anna Vesely and Angela Andreella

Non Parametric Combination methodology: a literature review on recent developments 1274
Elena Barzizza, Nicolò Biasetton and Riccardo Ceccato

Regression modeling

A Quantile Regression Model to Evaluate the Performance of the Italian Courts of Law 1280
Carlo Cusatelli, Massimiliano Giacalone and Eugenia Nissi

A variable selection procedure based on predictive ability: a preliminary study on logistic regression 1285
Rosaria Simone and Mariarosaria Coppola

Comparison of binary regressions with asymmetric link function for imbalanced data 1291
Michele La Rocca, Marcella Niglio and Marialuisa Restaino

New advances in Regression Forests 1297
Mila Andreani, Lea Petrella and Nicola Salvati

On the Optimal Non-Convexity of Penalty in Sparse Regression Models 1303
Daniele Cuntrera, Vito M.R. Muggeo and Luigi Augugliaro

Using expectile regression with latent variables for digital assets 1309
Beatrice Foroni, Luca Merlo and Lea Petrella

4 Program 1321

The determinants of leaving the parental home in Italy: 2012-18

Ilaria Rocco[a] and Gianpiero Dalla Zuanna[b]

[a] Sapienza Università di Roma, P.le A. Moro 5, 00185 Roma, Italy; Veneto Lavoro, via Ca' Marcello 67/b, 30173 Mestre-Venezia, Italy ilaria.rocco@uniroma1.it

[b] University of Padova, via Battisti 241, Padova 35121, Italy; gpdz@stat.unipd.it

Abstract

Using the longitudinal structure of the Istat Italian Labor Force Survey, we follow for 15 months the 77.700 young people aged 19-34 who, at the first interview during 2012-18, lived in their parental home, dividing them into four groups (Italian men, Italian women, foreign men, foreign women). In the fourth interview, 15 months after the first one, 16% of them are no longer resident with their parents. The main objective of this work is to model the probabilities of leaving the parental home with the characteristics of young people at the first interview, using logistic regression. The young Italians most likely to leave their parental home are those employed full-time, regardless of gender and type of contract (fixed-term or open-ended). Students remain more frequently with parents irrespective of gender and citizenship. Only for Italians, leaving home is faster if the family of origin is large and the parents are more educated.

Keywords: leaving home, young people, employment, gender, citizenship

1. Introduction

Leaving parental home is a key marker in the transition to adulthood [12, 29] and can have important consequences for young adults' life course outcomes. If on one hand a late exit from parental home may prolong the transition to adult roles [15, 17, 19], on the other one an early exit may instead be associated with earlier experiences of other events, such as exit from education, entry into work or forming a family, that could prevent young people from acquiring adequate human capital for later in life [24, 26].

A large demographic research literature has therefore addressed a broad array of individual, parental, and contextual characteristics shaping the decision of young adults to leave parental home in Western societies [1, 2, 9, 11, 12, 16, 20, 21, 22, 27, 30].

Among the numerous factors influencing this decision, difficulties in labour market integration and unstable working conditions may play an important role. Several studies showed the negative effects of job precariousness on the propensity of youth to leave the parental household [6, 16, 22, 32], that can vary depending on the institutional and cultural context, as well as according to gender and reason for leaving home [2, 16, 27]. Not only unemployment or inactivity may limit young people's opportunities to leave their parental home [2], but also the instability of employment [4, 5, 14], irrespective of the level of income received by young adults. An Italian study [3], confirmed by a comparative analysis between Italy and Spain [8], observed that being employed is a prerequisite to exit from the family household more important than income itself. However this results true only for men: being employed, unemployed or inactive does not influence women's propensity of leaving their parents.

From another body of literature it emerges that also the family background, that is linked to young adults' opportunity and need structure, may influence the transition out of the parental home. In particular

the parental education, that is a predictor of young adults' occupational achievement stronger than parents' occupational status and income [13], seems affect the probability of exiting from family home [10, 18, 23, 28, 31] depending on the modality of leaving home (i.e. with or without a partner) and young adults' gender [7].

This study focuses on Italy where the youth unemployment rate is one of the highest among the EU members and leaving home traditionally occurs at later ages than in Northern or Western Europe. In Southern-European countries, characterised by a familist welfare model, national policies to support individuals from job loss or in housing costs are less generous than those of Scandinavian countries and therefore the relationship between the labour market condition and the transition to residential autonomy tends to be stronger [25].

Our aim is to investigate the factors associated to the exit from the family household in recent years, considering both young adults' characteristics, their working condition and their familiar background. We intend to pay special attention to the gender dimension, and also introduce a citizenship perspective, that is still little explored.

2. Data and methods

The analysis is based on microdata from the Italian Labour Force Survey (ILFS) carried out by Istat. The ILFS is the largest survey conducted in Italy to monitor the quarterly dynamics of the labour market and it provides data on employment, wages, and workforce. This survey follows a rotating sample design, where households participate for two consecutive quarters; they exit for the following two quarters, and come back into the sample for a further two consecutive quarters. Therefore, 50% of the households interviewed in the course of a quarter are re-interviewed after 3 months, 50% after 12 months, 25% after 9 and 15 months, respectively. If an individual leaves the sampled family, he/she is not re-interviewed, but it is possible to know – in fact – that he/she no longer belongs to that family unit.

The access to this dataset with wider information than the free version was possible thanks to a data sharing agreement between Istat and the University of Padua.

The present work uses data for the period 2012-18 (first interview) and 2013-19 (fourth interview), and it focuses on the around 77 thousand individuals aged 19-34 living with their parents when the household was enrolled in the survey. We were interested to observe which subjects left the parental home during the 15-month follow-up in order to identify their main characteristics. We divided young respondents in four groups according to their gender and citizenship, and then we ran four separate logistic regressions to highlight the different factors associated to the propensity to leave the parental home in each group.

We estimated three models for each group by including explanatory variables according to three thematic blocks: socio-demographic characteristics (i.e. age, geographic repartition and year of enrolment); employment status (i.e. temporary/permanently fully/partially employed, students, jobseeker, inactive); household characteristics (i.e. educational level of parents and number of household members). Therefore, the first model (that will be called *m1* in Table 2 of the results section) includes only the socio-demographic characteristics of the individual; in the second one (*m2*) we added the variable on the employment status; finally in the last model (*m3*) we included all the three blocks of variables.

3. Results and preliminary conclusion

Among the 77.711 individuals aged 19-34 living with parents when their household was enrolled in the survey 6% have foreign citizenship (Table 1). The percentage of men is greater than that of women (55% among Italians and 58% among foreigners). Although the foreign subjects are younger than Italians, they are less involved in the educational process and more employed (also with open-ended contracts).

The foreign presence is concentrated in central-northern regions. Focusing on family characteristics, about one third of foreigners live with at least 4 people and nearly half of them have poorly educated parents.

During 15-month follow-up 16% of the total sample left the parental home: this percentage is higher among Italians and among women of both citizenships.

The logistic regression shows that age has a positive and significant effect on leaving the parental home among Italian males and females, but not for foreigners. Moreover, in comparison with Italians living in the Centre, those living in the South and the Islands are more likely to exit from the household during the

follow-up; among Italian females also living in the North-east has a positive effect on the propensity to leave the parental home. For the foreigners, there is no significant effect of the geographic repartition of residence.

Table 1: Sample description (weighted frequencies)

	Italians			Foreigners		
	Males	Females	Total	Males	Females	Total
Sample size	39.536	33.509	73.045	2.684	1.982	4.666
Age, mean (std. dev.)	25,3 (4,3)	24,5 (4,1)	24,9 (4,2)	24,1 (4,1)	23,7 (3,8)	23,9 (4,0)
Job condition						
Open-ended, FT[a]	20%	10%	15%	24%	11%	18%
Open-ended, PT[b]	3%	5%	4%	5%	11%	7%
Fixed-term, FT	11%	8%	9%	13%	7%	10%
Fixed-term, PT	3%	5%	4%	3%	6%	4%
Self-employed	9%	6%	8%	6%	3%	5%
Student	26%	37%	31%	18%	30%	23%
Jobseeker	16%	15%	15%	19%	17%	18%
Inactive	13%	14%	14%	12%	16%	14%
Geographic repartition						
Centre	19%	19%	19%	30%	27%	28%
Islands	13%	13%	13%	4%	3%	4%
North-east	17%	17%	17%	26%	26%	26%
North-west	23%	22%	23%	32%	35%	33%
South	29%	29%	29%	9%	10%	9%
Household members						
2	9%	7%	8%	12%	12%	12%
3	34%	32%	33%	24%	25%	24%
4	42%	44%	43%	32%	31%	31%
5+	16%	17%	16%	33%	33%	33%
Parental education						
Up to middle school	42%	40%	41%	48%	42%	45%
Secondary school	43%	44%	43%	43%	47%	44%
University	15%	16%	16%	9%	12%	10%
Left during the follow-up						
No	84%	82%	83%	85%	84%	84%
Yes	16%	18%	17%	15%	16%	16%

[a] Full time; [b] Part time

Focusing on the job condition, it emerges that students remain in the parental home more frequently than other occupational groups, regardless of their gender and citizenship. The same results are observed also for self-employed people, but only among Italians. Moreover, among Italian men and women what matters is not so much the duration of the contract but the working time: people with a part-time job have indeed a lower probability to leave than full-time workers while the duration of the contract has a not significant effect. The duration of the contract and the working time seem not to affect the propensity of foreign males of leaving their family; foreign females that work part-time with an open-ended contract are less likely to exit from the parental home than those with the same contract but a full-time position.

Table 2: Propensity to leave the parental household during 15-month follow-up. Estimated odds ratios from logit models

	Italian Females			Italian Males			Foreign Females			Foreign Males		
	m1	m2	m3	m1	m2	m3	m1	m2	m3	m1	m2	m3
Intercept	0,017	0,026	0,019	0,015	0,016	0,013	0,229	0,377	0,289	0,163	0,223	0,223
Age	1,101*	1,096*	1,097*	1,096*	1,100*	1,101*	1,008	0,993	0,993	1,019	1,008	1,007
Geographic repartition												
Centre	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Islands	1,224*	1,321*	1,377*	1,377*	1,566*	1,659*	1,651	1,631	1,742	1,711*	1,570	1,586
North-east	1,211*	1,158*	1,159*	1,062	1,015	1,030	1,370	1,317	1,327	0,893	0,911	0,905
North-west	1,095	1,051	1,068	1,054	1,025	1,049	1,086	1,099	1,122	1,011	1,006	1,005
South	1,120*	1,193*	1,223*	1,240*	1,355*	1,407*	1,307	1,314	1,344	1,404	1,333	1,342
Year of enrolment												
2012	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
2013	1,020	1,026	1,014	1,033	1,051	1,045	0,667	0,672	0,673	0,808	0,842	0,839
2014	1,083	1,102	1,086	1,138*	1,172*	1,160*	0,890	0,919	0,896	0,809	0,823	0,823
2015	1,071	1,088	1,075	1,063	1,093	1,078	0,376*	0,366*	0,361*	0,499*	0,513*	0,511*
2016	1,022	1,033	1,013	1,003	1,023	1,001	0,512*	0,528*	0,524*	0,480*	0,496*	0,496*
2017	1,073	1,080	1,060	1,011	1,024	0,997	0,603*	0,579*	0,575*	0,609*	0,621*	0,624*
2018	1,013	1,011	0,999	0,975	0,979	0,961	0,557*	0,558*	0,556*	0,447*	0,480*	0,483*
Job condition												
Open-ended, FT[a]		ref.	ref.		ref.	ref.		ref.	ref.		ref.	ref.
Open-ended, PT[b]		0,629*	0,630*		0,639*	0,630*		0,517*	0,508*		1,241	1,230
Fixed-term, FT[a]		1,022	0,973		1,021	0,993		1,765*	1,678		0,704	0,704
Fixed-term, PT[b]		0,725*	0,704*		0,677*	0,651*		0,695	0,665		1,561	1,554
Self-employed		0,742*	0,684*		0,790*	0,752*		0,609	0,580		0,604	0,605
Student		0,729*	0,630*		0,938	0,785*		0,619*	0,583*		0,559*	0,553*
Jobseeker		0,604*	0,597*		0,633*	0,623*		1,153	1,144		1,010	1,010
Inactive		0,590*	0,586*		0,495*	0,488*		1,114	1,114		1,418	1,408
Household members												
2			ref.			ref.			ref.			ref.
3			1,083			1,015			1,146			1,056
4			1,175*			1,026			1,055			0,905
5+			1,203*			1,185*			1,158			1,020
Parental education												
Up to middle school			ref.			ref.			ref.			ref.
Secondary school			1,242*			1,240*			1,342*			1,070
University			1,804*			1,886*			1,411			1,059

[a] Full time; [b] Part time; * $p<0.05$

Finally, the inclusion of variables on family size and parental education does not modify the effects previously described. We observe a significant effect of the number of household members and the parental education exclusively among Italian men and women: individuals living in large families and with parents having a middle/high education show a greater likelihood of leaving the parental home during the 15 months following the first interview. Since in Italy income is strongly and positively connected with the education, and since income is not a variable available for all the families interviewed, this result could also indicate that leaving the parental home is easier for the children of wealthier parents.

The present work contributes to the study of transition out of the parental home by differentiating according to young adults' gender and citizenship. Unfortunately, the information collected by ILFS is less

rich than that available for other dedicated surveys (such as Family and Social Subjects), and we do not have the characteristics of young people after they leave home (for example, we do not know their working conditions and their living arrangement). However – unlike what happens for dedicated surveys – ILFS has the advantage of being available every quarter of year, a few months after the survey, with large, statistically controlled samples, because they are used to measure employment and unemployment rates. It is therefore our intention to also analyse the data for subsequent years, for example by observing the effect on leaving home of the Covid-19 epidemic of 2020-21, and the subsequent recovery in employment.

References

[1] Aassve, A., Arpino, B., Billari, F.C.: Age norms on leaving home: Multilevel evidence from the European Social Survey. Environ. Plan A **45**(2), 383--401 (2013)

[2] Aassve, A., Billari, F.C., Mazzuco, S., Ongaro, F.: Leaving home: A comparative analysis of ECHP data. J. Eur. Soc. Policy **12**(4), 259--275 (2002)

[3] Aassve, A., Billari, F.C., Ongaro, F.: The impact of income and employment status on leaving home: Evidence from the Italian ECHP sample. Labour **13**(3), 501--529 (2001)

[4] Barbieri, P., Cutuli, G., Scherer, S.: Giovani e lavoro oggi. Uno sguardo sociologico a una situazione a rischio. Sociologia del lavoro (Young people and work today. A sociological look at a risk situation. Sociology of work). Issue 136, pp. 73-98 (2014)

[5] Becker, S.O., Bentolila, S., Fernandes, A., Ichino, A.: Youth emancipation and perceived job insecurity of parents and children. J. Popul. Econ. **23**(3), 1047--1071 (2010)

[6] Bertolini, S., Bolzoni, M., Ghislieri, C., Goglio, V., Martino, S., Meo, A., Moiso, V., Musumeci, R., Ricucci, R., Torrioni, P.M.: Labour market uncertainty and leaving parental home in Italy. In: Baranowska-Rataj, A., Bertolini, S., Goglio, V. (eds.) Country level analyses of mechanisms and interrelationships between labour market insecurity and autonomy. EXCEPT Working Paper No. 11, pp. 16-40. Tallin University, Tallin (2017)

[7] Bertolini, S., Goglio, V.: Job uncertainty and leaving the parental home in Italy: Longitudinal analysis of the effect of labour market insecurity on the propensity to leave the parental household among youth. Int. J. Sociol. Soc. 39(7/8), 574--594 (2019)

[8] Billari, F.C., Castiglioni, M., Casto Martin, T., Michielin, F., Ongaro, F.: Household and Union Formation in a Mediterranea Fashion: Italy and Spain. In: Klijzin, E., Corijn, M. (eds.) Dynamics of fertility and partnership in Europe, vol. II, 1-16, UNECE, New York and Geneva, United Nations (2002).

[9] Billari, F.C., Liefbroer, A.C.: Towards a new pattern of transition to adulthood? Adv. Life Course Res. **15**(2–3), 59--75 (2010)

[10] Blossfeld, H.-P., Huinink, J.: Human Capital Investments or Norms of Role Transition? How Women's Schooling and Career Affect the Process of Family Formation. Am. J. Sociol. **97**(1), 143--168 (1991)

[11] Chiuri, M.C., Del Boca, D.: Home-leaving decisions of daughters and sons. Rev. Econ. Househ. **8**(3): 393--408 (2010)

[12] Corijn, M., Klijzing, E. (eds.) Transition to adulthood in Europe. Kluwer Academic Publishers, Dordrecht (2001)

[13] Erola, J., Jalonen, S., Lehti, H.: Parental education, class and income over early life course and children's achievement. Res. Soc. Stratif. Mobil. **44**, 33--43 (2016)

[14] Fernandes, A., Becker, S.O., Bentolila, S., Ichino, A.: Income Insecurity and Youth Emancipation: A Theoretical Approach. B.E. J. Econ. Anal. Policy. **8**(1), (2008)

[15] Furstenberg, F. F. Jr.: On a new schedule: transitions to adulthood and family change. Future Child. **20**(1), 67--87 (2010)

[16] Iacovou, M.: Leaving home: Independence, togetherness and income. Adv. Life Course Res. **15**(4).147--160 (2010)

[17] Krahn, H.J., Chai, C.A., Fang, S., Galambos, N.L., Johnson, M.D.: Quick, uncertain, and delayed adults: timing, sequencing and duration of youth-adult transitions in Canada. J. Youth Stud. **21**(7), 905--921 (2018)

[18] Liefbroer, A.C., Billari, F.C.: Bringing norms back in: A theoretical and empirical discussion of their importance for understanding demographic behaviour. Popul. Space Place **16**(4), 287--305 (2010)

[19] Liefbroer, A.C., Toulemon, L.: Demographic perspectives on the transition to adulthood: An introduction. Adv. Life Course Res. **15**(2), 53--58 (2010)

[20] Mazzuco, S., Ongaro, F.: Parental separation and family formation in early adulthood: Evidence from Italy. Adv. Life Course Res. **14**, 119--130 (2009)

[21] Meggiolaro S., Ongaro F.: Leaving Home over the Recent Cohorts in Italy: Does Economic Vulnerability Matter? SocArXiv (2022)

[22] Mulder, C.H., Clark, W.A.V.: Leaving home and leaving the State: Evidence from the United States. Int. J. Popul. Geogr. **6**(6), 423--437 (2000)

[23] Mulder, C.H., Hooimeijer, P.: Leaving home in the Netherlands: Timing and first housing. J. Hous. Built Environ. **17**(3), 237--268 (2002)
[24] Osgood, D.W., Ruth, G., Eccles, J.S., Jacobs, J.E., Barber, B.L.: Six paths to adulthood: Fast starters, parents without careers, educated partners, educated singles, working singles, and slow starters. In: Settersten, R.A., Furstenberg, F.F., Rumbaut R.G. (eds.). On the frontier of adulthood: Theory, research, and public policy. pp. 320-355. University of Chicago Press, Chicago (2005)
[25] Ranci, C., Brandsen, T. Sabatinelli, S.: Social Vulnerability in European Cities: The Role of Local Welfare in Times of Crisis. Palgrave Macmillan (2014)
[26] Schwanitz, K.: The transition to adulthood and pathways out of the parental home: A cross-national analysis. Adv. Life Course Res. **32**, 21--34 (2017)
[27] Schwanitz, K., Mulder, C.H., Toulemon, L.: Differences in leaving home by individual and parental education among young adults in Europe. Demographic Res. **37**, 1975--2010 (2017)
[28] Settersten, R.A., Furstenberg, F.F., Rumbaut, R.G.: On the frontier of adulthood: Theory, research, and public policy. University of Chicago Press, Chicago (2005)
[29] Shanahan, M.J.: Pathways to Adulthood in Changing Societies: Variability and Mechanisms in Life Course Perspective, Annu. Rev. Sociol. **26**(1), 667--692 (2000)
[30] Tosi, M.: Age norms, family relationships, and home-leaving in Italy. Demographic Res. **36**(9), 281--306 (2017)
[31] Ward, R.A., Spitze, G.D.: Nestleaving and coresidence by young adult children: The role of family relations. Res. Aging **29**(3). 257--277 (2007)
[32] Whittington, L.A., Peters, H.E.: Economic incentives for financial and residential independence. Demography **33**(1), 82--97 (1996)