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Editors: Monica Pratesi and Cira Pena

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PLENARY SESSIONS

(A) E. Baldacci — Financial Crises and their Impacts: Data Gaps and Innovation in Statistical Production.

(B) D. Dunson — Probabilistic inference from big and complex data.

(C) S. Strozza — Foreign immigration in Italy: a forty-year-old history.

SPECIALIZED SESSION (SPE)

(SPE-01) Inference, sampling and survey design

P. Conti — Resampling from finite populations under complex designs: the pseudo-population approach. (Co-author(s): F. Andreis, D. Marella, F. Mecatti)

P. Righi — A joint use of model based and design based frameworks for defining optimal sampling designs. (Co-author(s): P. D. Falorsi)

A. Ruiz-Gazen — A unified approach for robustness in survey sampling. (Co-author(s): J. Beaumont, D. Haziza)

(SPE-02) Multivariate models for risk assessment

M. Billio — A Bayesian nonparametric approach to macroeconomic risk. (Co-author(s): R. Casarin, M. Costola, M Guindani)

P. Cerchiello — Bank risk contagion:an analysis through big data. (Co-author(s): P. Giudici, G. Nicola)

L. De Angelis — A Markov-switching regression model with non-Gaussian innovations for systemic risk measurement. (Co-author(s): C. Viroli)

(SPE-03) Bayesian nonparametrics

D. Durante — Bayesian Nonparametric Modeling of Dynamic International Relations. (Co-author(s): D. Dunson)

A. Guglielmi — Bayesian autoregressive semiparametric models for gap times of recurrent events. (Co-author(s): G. Paulon, M. De Iorio)

A. Rodriguez — Restricted Nonparametric Mixtures models for Disease Clustering. (Co-author(s): T. Xifara)

(SPE-04) Statistical methods for the analysis of gene-environment interaction in the study of complex pathologies

C. Angelini — An introduction to next generation sequencing for studying omic-environment interactions.

L. Calciano — Statistical approaches for the evaluation of genetic associations in complex diseases: the heterogeneity of asthma phenotypes. (Co-author(s): L. Portas, S. Accordini)

Y. Pankaj — Improved case-only approach to study genome-wide gene-environment interaction. (Co-author(s): S. Freitag-Wolf, A. Dempfle, W. Lieb, M. Krawczak)

(SPE-05) Nonlinear time series

M. Niglio — Probabilistic properties of Self Exciting Threshold Autoregressive processes. (Co-author(s): F. Giordano, C. D. Vitale)

T. Proietti — Optimal prediction of stochastic trends. (Co-author(s): A. Giovannelli)

H. Tong — On model selection from a finite family of possibly misspecified models. (Co-author(s): H. Hsu, C. Ing)

(SPE-06) Spatial analyses in demography

F. Heins — Measuring residential segregation with spatial indices: an appraisal and applications for the metropolitan area of Rome. (Co-author(s): F. Benassi, F. Lipizzi, E. Paluzzi)

A. Mazza — Immigrants' settlement patterns in the city of Naples. (Co-author(s): G. Gabrielli, S. Strozza)

L. Natale — Native Immigration and Pull Factor Evolution in Italy: a Spatial Approach. (Co-author(s): A. Santacroce, F. G. Truglia)

(SPE-07) Recent developments in Volatility modeling

R. Casarin — Dynamic Model Averaging for Quantile Regression. (Co-author(s): M. Bernardi, B. Maillet, L. Petrella)

A. Rahbek — Testing volatility: consistency of bootstrap testing for a parameter on the boundary of the parameter space.

E. Ruiz — Asymmetric Stochastic Volatility Models: Properties and Estimation. (Co-author(s): V. Czellar, X. Mao, H. Veiga)

(SPE-08) Advances in ordinal contingency table analysis

L. D'Ambra — Dimensionality reduction methods for contingency tables with ordinal variables. (Co-author(s): P. Amenta, A. D'Ambra)

R. Lombardo — Modelling Trends in Ordered Three-Way Non-Symmetrical Correspondence Analysis. (Co-author(s): P. Kroonenberg, E. Beh)

M. Riani — Using Collapsing and Multiple Comparisons to Detect Association in Two Way Contingency Tables. (Co-author(s): S. Arsenis)

(SPE-09) Statistical models for directional and circular data

C. Ley — The WeiSSVM: a tractable, parsimonious and flexible model for cylindrical data.

G. Mastrantonio — The multivariate projected-skew normal distribution: Bayesian estimation and a hidden Markov model application.

A. Panzera — Circular density estimation via matching local trigonometric moments. (Co-author(s): M. Di Marzio, S. Fensore, C. C. Taylor)

(SPE-10) The interplay between frequentist and bayesian inference

C. Grazian — Classical inference for intractable likelihoods.

J. Hannig — Fusion learning for Interlaboratory Comparison. (Co-author(s): Q. Feng, H. Iyer, C. Wang, X. Liu)

F. Pauli — p-value in science: a review of issues and proposed solutions.

(SPE-11) Société Française de Statistique

B.H. Avner — Stochastic Block Model for Multiplex network: an application to a multilevel network of researchers..

Y. Bennani — Nonnegative Matrix Factorization for Transfer Learning. (Co-author(s): I. Redko)

T. Laloe — Detection of dependence patterns with delay.

J. Poggi — Disaggregated Electricity Forecasting using Wavelet-Based Clustering of Individual Consumers. (Co-author(s): J. Cugliari, Y. Goude)

(SPE-12) National accounts

A. Coli — The European Welfare State in times of crisis according to macroeconomic official statistics. (Co-author(s): E. Micheletti, B. Pacini)

C. Martelli — National Account and Open Data: a new semantic approach.

G. Oneto — New information contents of the National Accounts for the monitoring of the economic situation.

(SPE-13) Statistical tools for monitoring the educational system and assessing students' performances

L. Grilli — Evaluation of university students' performance through a multidimensional finite mixture IRT model. (Co-author(s): S. Bacci, F. Bartolucci, C. Rampichini)

G. Leckie — Monitoring school performance using value-added and value-table models: Lessons from the UK.

P. Sarnacchiaro — A statistical model to assess teacher performance. (Co-author(s): I. Camminatiello, R. Palma)

(SPE-14) Robust inference by bounded estimating functions

A.C. Monti — M Estimation based Inference for Ordinal Response Model.

E. Ruli — Approximate Robust Bayesian Inference with an Application to Linear Mixed Models. (Co-author(s): N. Sartori, L. Ventura)

J. Valeinis — Some robust methods using empirical likelihood for two samples. (Co-author(s): M. Velina, E. Cers, G. Luta)

SOLICITED SESSION (SOL)

(SOL-01) Subjective wellbeing and demographic events over the life course

G. Fuochi — Cultural and institutional drivers of basic psychological needs satisfaction. (Co-author(s): P. Conzo, A. Aassve, L. Mencarini)

L. Mencarini — Five reasons to be happy about childbearing. (Co-author(s): A. Aassve, F. Luppi)

B. Nowok — Migration motivations and migrants' satisfaction in the life course: A sequence analysis of geographical mobility trajectories in the United Kingdom.

A. Pirralha — Does becoming a parent change the meaning of happiness and life satisfaction? Evidence from the European Social Survey. (Co-author(s): H. Dobewall)

(SOL-02) Statistics for equitable and sustainable development

E. di Bella — Wellbeing and sustainable development: a multi-indicator approach to evaluate urban waste management systems. (Co-author(s): B. Cavalletti, M. Corsi)

C. Giusti — Small Area Estimation for Local Welfare Indicators in Italy. (Co-author(s): S. Marchetti, L. Faustini, L. Porciani)

T. Laureti — Does socio-economic variables influence the Italians' adherence towards a sustainable diet?. (Co-author(s): L. Secondi)

F. Riccardini — Sustainability of wellbeing: an analysis of resilience and vulnerability through subjective indicators. (Co-author(s): M. Bachelet, F. Maggino)

(SOL-03) New approaches to treat undercoverage and nonresponse

F. Andreis — Methodological perspectives for surveying rare and clustered population: towards a sequentially adaptive approach.

E. Furfaro — Dealing with under-coverage bias via Dual/Multiple Frame designs: a simulation study for telephone surveys.

D. Haziza — Weight adjustment procedures for the treatment of unit nonresponse in surveys. (Co-author(s): É. Lesage)

E. Kabzinska — Empirical likelihood multiplicity adjusted estimator for multiple frame surveys. (Co-author(s): Y. G. Berger)

(SOL-04) Statistical models and methods for network data

M. Cugmas — Measuring stability of co-authorship structures in time. (Co-author(s): A. Ferligoj)

J. Koskinen — A dynamic discrete-choice model for movement flows. (Co-author(s): T. Mueller, T. Grund)

G. Ragozini — Prototyping and Comparing Networks through Archetypal Analysis. (Co-author(s): D. De Stefano, M.R. D'Esposito)

S. Zaccarin — Modeling network dynamics: evidence from policy-driven innovation networks. (Co-author(s): A. Caloffi, D. De Stefano, F. Rossi, M. Russo)

(SOL-05) Recent developments in computational statistics

R. Argiento — A conditional algorithm for Bayesian finite mixture models via normalized point process.

S. Favaro — Thompson sampling for species discovery. (Co-author(s): M. Battiston, Y. Teh)

A. Mira — An application of Reinforced Urn Process to advice network data. (Co-author(s): S. Peluso, P. Muliere, F. Pallotti, A. Loni)

N. Sartori — Bootstrap prepivoting in the presence of many nuisance parameters. (Co-author(s): R. Bellio, I. Kosmidis, A. Salvan)

(SOL-06) Statisticians meet naturalists: issues on ecological and environmental statistics

F. Ferretti — Estimating the abundance of wildlife ungulate populations in Mediterranean areas: methods, problems and findings. (Co-author(s): A. Sforzi)

M. Ferretti — The monitoring of forests in Europe: methods, problems and proposals.

D. Rocchini — The power of generalized entropy for biodiversity assessment by remote sensing: an open source approach. (Co-author(s): L. Delucchi, G. Bacaro)

(SOL-07) From survey data to new data sources and big data in official statistics

G. Barcaroli — Machine learning and statistical inference: the case of Istat survey on ICT. (Co-author(s): G. Bianchi, R. Bruni, A. Nurra, S. Salamone, M. Scarnò)

S. Falorsi — Forecasting Italian Youth Unemployment Rate Using Online Search Data. (Co-author(s): S. Loriga, A. Naccarato, A. Pierini)

B. Liseo — Bayesian nonparametric methods for record linkage. (Co-author(s): A. Tancredi)

T. Tuoto — Exploring solutions for linking Big Data in Official Statistics. (Co-author(s): L. Di Consiglio, D. Fusco)

(SOL-08) Symbolic data analysis methods and applications

E. Diday — Explanatory and discriminatory power of variables in Symbolic Data Analysis.

M.B. Ferraro — Fuzzy and possibilistic approach to clustering of imprecise data. (Co-author(s): P. Giordani)

L. Grassini — Symbolic data analysis approach for monitoring the stability of monuments.. (Co-author(s): B. Bertaccini, G. Biagi, A. Giusti)

M. Ichino — Similarity and Dissimilarity Measures for Mixed Feature-type Symbolic Data. (Co-author(s): K. Umbleja)

(SOL-09) Compositional analysis

L. Crosato — Forecasting CPI weights through compositional VARIMA: an application to Italian data.. (Co-author(s): F. Lovisolo, B. Zavanella)

J. A. Martín-Fernández — Understanding association rules from a compositional data approach. (Co-author(s): M. Vives-Mestres, R. Kenett)

A. Menafoglio — Object Oriented Geostatistical Simulation of Functional Compositions via Dimensionality Reduction in Bayes spaces. (Co-author(s): A. Guadagnini, P. Secchi)

V. Simonacci — Fitting CANDECOMP-PARAFAC model for compositional data: a combined SWATLD-ALS algorithm. (Co-author(s): M. Di Palma, V. Todorov)

(SOL-10) Sustainable development: theory, measures and applications

F. Riccardini — Measuring sustainable development goals from now to 2030.

F. Riccardini — How the nexus of food/water/energy can be seen with the perspective on well-being of people and the Italian BES framework. (Co-author(s): D. De Rosa)

T. Rondinella — An innovative methodology for the analysis of sustainability, inclusion and smartness of growth through Europe2020 indicators.. (Co-author(s): E. Grimaccia)

P. Ungaro — The Italian population behaviours toward environmental sustainability: a study from Istat surveys. (Co-author(s): I. Mingo, V. Talucci)

(SOL-11) Detecting heterogeneity in ordinal data surveys

E. Di Nardo — CUB models: a preliminary Fuzzy approach to heterogeneity. (Co-author(s): R. Simone)

S. Giordano — Modelling uncertainty in bivariate models for ordinal responses. (Co-author(s): R. Colombi, A. Gottard, M. Iannario)

M. Manisera — Treatment of "don't know" responses in rating data: effects on the heterogeneity of the CUB distribution. (Co-author(s): P. Zuccolotto)

F. Pennoni — Modelling a multivariate hidden Markov process on survey data.

(SOL-12) Active ageing: age management and lifelong learning strategies

P. E. Cardone — Age management in Italian companies. Findings of two Isfol surveys. (Co-author(s): M. Aversa, L. D'Agostino)

A. Lorenti — Working after Retirement in Europe.

C. Polli — Older low-skilled workers and economic crisis in Italy. (Co-author(s): R. Angotti)

G. Rivellini — Population ageing and human resources management. A chance for Applied Demography. (Co-author(s): F. Marcaletti, F. Racioppi)

(SOL-13) Statistical models for evaluating policy impact

M. Bia — Evaluation of Training Programs by exploiting secondary outcomes in Principal Stratification frameworks: the case of Luxembourg. (Co-author(s): F. Li, A. Mercatanti)

G. Cerulli — Testing Stability of Regression Discontinuity Models. (Co-author(s): Y. Dongz, A. Lewbel, A. Poulsen)

R. P. Mamede — Counterfactual Impact Evaluation of Vocational Education in Portugal. (Co-author(s): D. Cruz, T. Fernandes)

G. Pellegrini — Italian public guarantees to SME: the impact on regional growth. (Co-author(s): M. De Castris)

(SOL-14) Usage of geocoded micro data in the economic analysis

M. Dickson — Spatial sampling methods with locational errors. (Co-author(s): D. Filipponi)

D. Giuliani — Spatial Micro-Econometrics Models with Locational Errors. (Co-author(s): S. Cozzi, G. Espa)

F. Santi — Three-Year Survival Probability of Italian Start-up Businesses in Healthcare Industry: an Empirical Investigation through Logistic Multilevel Modelling. (Co-author(s): M. M. Dickson, D. Giuliani, D. Piacentino)

(SOL-15) Statistical models in functional data analysis

G. Adelfio — Space-time FPCA Algorithm for clustering ofmultidimensional curves. (Co-author(s): F. Di Salvo, M. Chiodi)

C. Miller — Functional data analysis approaches for satellite remote sensing applications. (Co-author(s): R. O'Donnell, M. Gong, M. Scott)

E. Romano — Order statistics for spatially dependent functional data. (Co-author(s): A. Balzanella, R. Verde)

L. M. Sangalli — A penalized regression model for functional data with spatial dependence. (Co-author(s): M. S. Bernardi, G. Mazza, J. O. Ramsay)

(SOL-16) Forecasting economic and financial time series

G. Goracci — Asymptotics and power of entropy based tests of dependence for categorical data. (Co-author(s): S. Giannerini)

M. M. Pelagatti — Forecasting electricity load and price: a comparison of different approaches. (Co-author(s): F. Lisi)

G. Storti — Flexible Realized GARCH Models. (Co-author(s): R. Gerlach)

(SOL-17) Immigrations and integration in Italy

O. Casacchia — Minorities internal migration in Italy: an analysis based on gravity models. (Co-author(s): C. Reynaud, S. Strozza, E. Tucci)

C. Conti — Growing generations and new models of integration.

N. Tedesco — Measurement of segregation in the labour market. An alternative approach. (Co-author(s): L. Salaris)

L. Terzera — Family behaviours among first generation migrants. (Co-author(s): E. Barbiano di Belgiojoso)

(SOL-18) Open data, linked data and big data in public administration and official statistics

G. Di Bella — Linked Administrative Data in Official Statistics: a Positive Feedback for the Quality?. (Co-author(s): G. Garofalo)

C. Martelli — Generating high quality administrative data: new technologies in a national statistical reuse perspective. (Co-author(s): M. Calzaroni, A. Samaritani)

V. Santarcangelo — An innovative approach about the analysis of quality and efficiency in Italian law. (Co-author(s): A. Buondonno, A. Romano, M. Giacalone, C. Cusatelli)

B. Squittieri — Prato municipality experience towards a high integration between administrative and statistical data.

(SOL-19) Evaluation of prognostic biomarkers

F. Ambrogi — Combining Clinical and Omics data: hope or illusion?. (Co-author(s): P. Boracchi)

L. Antolini — Graphical representations and summary indicators to assess the performance of risk predictors. (Co-author(s): D. Bernasconi)

P. Chiodini — Multivariable prognostic model: external validation and model recalibration with application to non-metastatic renal cell carcinoma. (Co-author(s): L. Cindolo)

(SOL-20) Models for studying the mobility of students

S. Balia — Modelling inter-regional patient mobility: evidence from the Italian NHS. (Co-author(s): R. Brau, E. Marrocu)

A. D'Agostino — University mobility at enrollment: geographical disparities in Italy. (Co-author(s): G. Ghellini, S. Longobardi)

M. Enea — From South to North? Mobility of Southern Italian students at the transition from the first to the second level university degree.

F. Giambona — Measuring territory student-attractiveness in Italy. Longitudinal evidence.

CONTRIBUTED SESSION (CON)

(CON-01) Bayesian statistics (1)

F. Giummolè — Reference priors based on composite likelihoods. (Co-author(s): V. Mameli, L. Ventura)

B. Nipoti — On Bayesian nonparametric inference for discovery probabilites. (Co-author(s): J. Arbel, S. Favaro, Y. W. Teh)

R. Pappadà — Relabelling in Bayesian mixture models by pivotal units. (Co-author(s): L. Egidi, F. Pauli, N. Torelli)

C. Scricciolo — On Deconvolution of Dirichlet-Laplace Mixtures.

(CON-02) Statistical modeling

P. Faroughi — A New Bivariate Regression Model for Count Data with Excess Zeros. (Co-author(s): N. Ismail)

B. Francis — Dynamic latent class profiles in cross-sectional surveys: some preliminary results. (Co-author(s): V. Hoti)

P. M. Kroonenberg — The use of deviance plots for non-nested model selection in loglinear models, structural equations, three-mode analysis.

A. Lucadamo — Variable selection through Multinomial LASSO for PCMR. (Co-author(s): L. Greco)

O. Paccagnella — Integrating CUB Models and Vignette Approaches. (Co-author(s): S. Pavan, M. Iannario)

(CON-03) Demographics and social statistics (1)

D. Bellani — Gender egalitarianism, education and life-long singlehood: A multilevel analysis. (Co-author(s): G. Esping-Andersen, L. Nedoluzhko)

L. Colangelo — Fear of Crime and Victimization among Sexual Harassed Women: Evidence from Italy. (Co-author(s): P. Mancini)

S. De Cantis — A survival approach for the analysis of cruise passengers' behavior at the destination. (Co-author(s): M. Ferrante, A. Parroco, N. Shoval)

A. Di Pino — Retirement of the Male Partner and the Housework Division in the Italian Couples: Estimation of the Causal Effects. (Co-author(s): M. Campolo)

F. Lariccia — Many women start, but few continue: determinants of breastfeeding in Italy. (Co-author(s): A. Pinnelli)

(CON-04) Environmental statistics

F. Bono — Measuring sustainable economic development through a multidimensional Gini index. (Co-author(s): M. Giacomarra, R. Giaimo)

C. Calculli — Modeling multi-site individual corals growth. (Co-author(s): B. Cafarelli, D. Cocchi, E. Pignotti)

F. Di Salvo — GAMs and functional kriging for air quality data. (Co-author(s): A. Plaia, M. Ruggieri)

F. Durante — The Kendall distribution and multivariate risks.

(CON-05) Health statistics

E. di Bella — Dental care systems across Europe: the case of Switzerland. (Co-author(s): L. Leporatti, I. Krejci, S. Ardu)

F. Gasperoni — Multi-state models for hospitalizations of heart failure patients in Trieste. (Co-author(s): F. Ieva, G. Barbati)

F. Grossetti — Multi-state Approach to Administrative Data on Patients affected by Chronic Heart Failure. (Co-author(s): F. Ieva, S. Scalvini, A. M. Paganoni)

G. Montanari — Evaluation of health care services through a latent Markov model with covariates. (Co-author(s): S. Pandolfi)

(CON-06) Labor market statistics

A. Bianchi — Multifactor Partitioning: an analysis of employment and firm size. (Co-author(s): S. Biffignandi)

G. Busetta — Ugly Betty looks for a job. Will she ever find it in Italy?. (Co-author(s): F. Fiorillo)

G. Busetta — No country for foreigners: an analysis of hiring process in Italian labor market. (Co-author(s): M. Campolo, D. Panarello)

F. Crippa — Know your audience. Towards a partnership between employers and university. (Co-author(s): M. Zenga)

I. Vannini — Online Job Vacancies: a big data analysis. (Co-author(s): D . Rotolone, C. Di Stefano, A. P. Paliotta, D. F. Iezzi)

(CON-07) Robust statistics

F. Greselin — Robust estimation of mixtures of skew-normal distributions. (Co-author(s): L. García-Escudero, A. Mayo-Iscar, G. McLachlan)

M. Musio — Renyi's Scoring Rules. (Co-author(s): A. F. Dawid)

A. Paganoni — Robust classification of multivariate functional data. (Co-author(s): F. Ieva)

G. C. Porzio — A robust estimator for the mean direction of the von Mises-Fisher distribution. (Co-author(s): T. Kirschstein, S. Liebscher, G. Pandolfo, G. Ragozini)

F. Palumbo — Robust Partial Possibilistic Regression Path Modeling. (Co-author(s): R. Romano)

(CON-08) Sampling methods

A. Ghiglietti — Adaptive Randomly Reinforced Urn design and its asymptotic properties.

D. Marella — PC algorithm from complex sample data. (Co-author(s): P. Vicard)

S. Missiroli — Optimal Adaptive Group Sequential Procedure for Finite Populations in the Presence of a Cost Function. (Co-author(s): E. Carfagna)

E. Pelle — The Rao regression-type estimator in ranked set sampling. (Co-author(s): P. Perri)

M. Ruggiero — Modelling stationary varying-size populations via Polya sampling. (Co-author(s): P. De Blasi, S. Walker)

(CON-09) Economic data analysis

M. Brunetti — Getting older and riskier: the effect of Medicare on household portfolio choices. (Co-author(s): M. Angrisani, V. Atella)

E. Ciavolino — Modelling the Public Opinion on the European Economy with the HO-MIMIC Model. (Co-author(s): M. Carpita)

G. D'Epifanio — Indexing the Worthiness of Social Agents. To norm index on conventional specifications.

G. Guagnano — An econometric model for undeclared work. (Co-author(s): M. Arezzo)

M. Mussini — A spatial shift-share decomposition of energy consumption variation. (Co-author(s): L. Grossi)

(CON-10) Quantile methods

M. Bernardi — Bayesian inference for L_p–quantile regression models. (Co-author(s): V. Bignozzi, L. Petrella)

V. Bignozzi — On the L_p-quantiles and the Student t distribution. (Co-author(s): M. Bernardi, L. Petrella)

M. Marino — M-quantile regression for multivariate longitudinal data. (Co-author(s): M. Alfò, M. Ranalli, N. Salvati)

D. Vistocco Comparing Prediction Intervals in Quantile and OLS Regression. (Co-author(s): C. Davino)

(CON-11) Statistical algorithms

N. Loperfido An Algorithm for Finding Projections with Extreme Kurtosis. (Co-author(s): C. Franceschini)

L. Scrucca Poisson change-point models estimated by Genetic Algorithms.

A. Stamm Maximum Likelihood Estimators of Brain White Matter Microstructure. (Co-author(s): O. Commowick, S. Vantini, S. K. Warfield)

(CON-12) Statistics for medicine

G. Barbati Competing risks between mortality and heart failure hospital re-admissions: a community-based investigation from the Trieste area. (Co-author(s): F. Ieva, A. Scagnetto, G. Sinagra, A. Di Lenarda)

C. Brombin Evaluating association between emotion recognition and Heart Rate Variability indices. (Co-author(s): F. Cugnata, R. M. Martoni, M. Ferrario, C. Di Serio)

M. Ferrante Socio-economic deprivation, territorial inequalities and mortality for cardiovascular diseases in Sicily. (Co-author(s): A. Milito, A. Parroco)

M. Giacalone The use of Permutation Tests on Large-Sized Datasets. (Co-author(s): A. Alibrandi, A. Zirilli)

(CON-13) Statistics for the education system

G. Boscaino Further considerations on a new indicator for higher education student performance. (Co-author(s): G. Adelfio, V. Capursi)

C. Masci Analysis of pupils' INVALSI achievements by means of bivariate multilevel models. (Co-author(s): A. Paganoni, F. Ieva, T. Agasisti)

A. Valentini Promoting statistical literacy to university students: a new approach adopted by Istat. (Co-author(s): G. De Candia, M . Carbonara)

(CON-14) Testing procedures

E. Cascini A Reliability Problem: Censored Tests.

G. De Santis Testing the Gamma-Gompertz-Makeham model. (Co-author(s): G. Salinari)

M. M. Pelagatti A nonparametric test of independence.

A. Pini Functional Data Analysis of Tongue Profiles. (Co-author(s): L. Spreafico, S. Vantini, A. Vietti)

A. Vagheggini On the asymptotic power of the statistical test under Response-Adaptive randomization. (Co-author(s): A. Baldi Antognini, M. Zagoraiou)

(CON-15) Time series analysis

C. Cappelli Robust Atheoretical Regression Tree to detect structural breaks in financial time series. (Co-author(s): P. D'Urso, F. Di Iorio)

P. Chirico Prediction intervals for heteroscedastic series by Holt-Winters methods.

M. Costa Inequality decomposition for financial variables evaluation.

G. De Luca Three-stage estimation for a copula-based VAR model. (Co-author(s): G. Rivieccio)

(CON-16) Forecasting methods

M. Andreano Forecasting with Mixed Data Sampling Models (MIDAS) and Google trends data: the case of car sales in Italy. (Co-author(s): R. Benedetti, P. Postiglione)

V. Candila Probability forecasts in the market of tennis betting: the CaSco normalization. (Co-author(s): A. Scognamillo)

S. Vantini Daily Prediction of Demand and Supply Curves. (Co-author(s): A. Canale)

(CON-17) Bayesian statistics (2)

G. Marchese Bayesian hierarchical models for analyzing and forecasting football results. (Co-author(s): P. Brutti, S. Gubbiotti)

L. Paci Bayesian modeling of spatio-temporal point patterns in residential property sales. (Co-author(s): A. E. Gelfand, M. Beamonte, P. Gargallo, M. Salvador)

V. Vitale Non-parametric Bayesian Networks for Managing an Energy Market. (Co-author(s): V. Guizzi, F. Musella, P. Vicard)

(CON-18) Business statistics

E. Bartoloni How do firms perceive their competitiveness? Measurement and determinants.

C. Bocci An evaluation of export promotion programmes with repeated multiple treatments. (Co-author(s): M. Mariani)

A. Righi The inter-enterprise relations in Italy. (Co-author(s): A. Nuccitelli, G. Barbieri)

(CON-19) Clustering and classification

C. Drago Dendrograms Stability Analysis of Sub-periods Time Series Clustering. (Co-author(s): R. Ricciuti)

G. Menardi Stability-based model selection in nonparametric clustering.

T. Padellini Topological signatures for classification. (Co-author(s): P. Brutti)

(CON-20) Demographics and social statistics (2)

M. Antonicelli — Ecolabels: informin or confusing customers? Evidences form the agrifood sector. (Co-author(s): D. Calace, D. Morrone, A. Russo, V. Vastola)

B. Arpino — What makes you feeling old? An analysis of the factors influencing perceptions of ageing. (Co-author(s): V. Bordone, A. Rosina)

G. De Santis — A (partial) solution to the intractability of APC models. (Co-author(s): M. Mucciardi)

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Multifactor Partitioning: an analysis of employment and firm size

Multifactor Partitioning: un'analisi dell'occupazione e della dimensione

Annamaria Bianchi, Silvia Biffignandi[1]

Abstract This paper discusses the effects of size on employment in Italy during the crisis started in 2008. The multifactor partitioning technique is proposed for the analysis. The approach is new in this application field and proves to be useful. The empirical investigation shows a heterogeneous behavior among classes, especially for micro-units.

Abstract *Questo articolo studia gli effetti della dimensione sulla variazione di occupazione in Italia durante la crisi iniziata nel 2008. La tecnica multifactor partitioning è proposta per l'analisi. Tale approccio è innovativo in questo campo di applicazione. L'analisi empirica mostra un comportamento eterogeneo tra le classi, in particolare per le micro-unità.*

Key words: Italy, shift-share, crisis

Introduction

Understanding the determinants of firm performance has been a very rich field of research for long time. To the best of the authors' knowledge this is one of the few studies addressing this question in the recent economic crisis.

This paper studies the effects of crises on employment and tries to understand whether the size of firms has an impact on employment changes. More precisely, we

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investigate whether micro, small and medium units were more negatively affected than large units during the crisis started in 2008. Indeed, recessions associated with financial and banking turbulence such as the recent one, can have disproportionate negative impacts on small businesses. They are more sensitive to changed financial conditions (Erixon 2009). Thus they can be more penalized.
The empirical analysis is carried out with reference to the Italian case, using data from the Italian Business Statistical Register of Local Units (ASIA – Local units), for the years 2007 and 2010. We propose to use the Ray-Srinath multifactor partitioning (MFP) model to study the size-growth relationship. This approach was first introduced by [7] and recently discussed by [6] and [8]. MFP is essentially an extension of shift-share analysis.
This is a novelty in the literature on this issue. Indeed, the most popular approach to study the relationship between size and employment change is to use firm-level data and to run a cross-section/panel regression of the growth in employment on enterprise size while including control variables [5]. A slightly separate literature analyzes the effect of firm size on employment changes at the regional level. In this case regional aggregated data are used. Usually, a firm related measure (e.g. the total number of small businesses in a region) is included as an explanatory variable in a regression for the employment in the region [2].

Data and methodology

The data source is the Italian Business Statistical Register of Local Units (ASIA – Local units), for the years 2007-2010. This database contains several variables for local units, including information on employment. The register records all local units operating in the manufacturing and services sectors. We consider businesses classified according to economic activity (one-letter classification in Ateco 2007 -- Italian version of the European classification Nace Rev. 2), macro-regions (Northwest, Northeast, Centre, South, and Islands, corresponding to Nuts1 areas), and size classes based on employment (0-9, 10-19, 20-49, 50 and more). Since the unit of analysis is the establishment and not the firm, we decided not to use the standard size class breakdown [4].
Table 1 reports employment distribution by size class and the corresponding net change occurred over the period 2007-2010. Differential changes are observed in different size classes.

Table 1 Employment by size class (2007) and corresponding change, 2007-2010.

	2007	2007-2010 change	
Class Size (Nr. Employees)	Nr. Employees	Nr. Employees	Crude size rate
1-9	8,132,738	-239,468	-2.94
10-19	2,049,544	-39,281	-1.92

20-49	1,924,464	-12,629	-0.66
≥ 50	4,187,744	-132,743	-3.17
Total	16,294,491	-424,122	-2.60

The observed changes are investigated by the MFP approach. MFP was introduced by [7] and later discussed by [6]. It is an extension of shift-share analysis. The advantages of the MFP methodology are that: it allows to identify the separate effects of size, business cycle, industrial composition, and regional advantages on employment growth for each size-class, it does not need the specification of a model, it is based on standardized rates rather than crude rates, and it only requires a small number of aggregated data.

The components identified by MFP are defined according to the following equation:

$$r_{\bullet\bullet k} = \underbrace{r_{\bullet\bullet\bullet}}_{\text{national effect}} + \underbrace{(\hat{r}_{\bullet\bullet\bullet} - r_{\bullet\bullet\bullet})}_{\text{allocation effect}} + \underbrace{(\hat{r}_{\bullet\bullet k} - \hat{r}_{\bullet\bullet\bullet})}_{\text{size effect}} + \underbrace{\sum_{ij} \frac{E_{ijk}}{E_{\bullet\bullet k}} (\hat{r}_{i\bullet\bullet} - \hat{r}_{\bullet\bullet\bullet})}_{\text{industry-mix effect}} + \underbrace{\sum_{ij} \frac{E_{ijk}}{E_{\bullet\bullet k}} (\hat{r}_{\bullet j\bullet} - \hat{r}_{\bullet\bullet\bullet})}_{\text{region-mix effect}} + \underbrace{INT_k}_{\text{interactions}},$$

where $r_{\bullet\bullet k}$ ($\hat{r}_{\bullet\bullet k}$) is the crude (standardized) rate of size *k*, $r_{\bullet\bullet\bullet}$ ($\hat{r}_{\bullet\bullet\bullet}$) the overall crude (standardized) rate, $\hat{r}_{i\bullet\bullet}$ the standardized rate of industry *i*, $\hat{r}_{\bullet j\bullet}$ the standardized rate of region *j*, E_{ijk} the number of employment in industry *i*, region *j* and size *k* at time 0, $E_{\bullet\bullet k}$ the number of employment in size *k*. Refer to [7] for the analytical definition of standardized rates and interactions.

The *national effect* is the change in a size class that would have occurred if the class had grown at the national rate. It measures the effects of macroeconomic fluctuations on change. The *allocation effect* measures the extent to which location of economic activity enhances national rates. The *size component* captures the pure effect attributable to size, freed from the effects of industry-mix, regional distribution and business cycle. This component reflects the size competitive position and can be attributed to size advantages or disadvantages. The *industry-mix effect* measures the proportion of change attributable to the industrial composition within each size class. A size class with a concentration of fast-growth industries will have a favourable industry-mix effect. The *region-mix effect* captures the proportion of change which can be ascribed to the regional distribution of firms within each size class. Further, four interaction effects are identified: industry-region, industry-size, region-size and industry-size-region. Each region has specific resources and locational attributes that have a differential value for each industry according to its needs. The *industry-region interaction* is an aggregate measure of such specific advantages within each size class. The *industry-size interaction* reflects internal economies of scale, while the *region-size interaction* measures external economies of scale. Finally, the *industry-size-region interaction* is a very specific agglomeration economy measure.

Results

The results of MFP are summarized in Table 2. They show that next to the national growth effect, size and industry-mix effects dominate employment changes across firm size-groups. This underlines that employment dynamics, and in particular units' size structure, are not only related to the macroeconomic cycle, but also and especially to the structural characteristics of the industrial system. A differential behavior of micro-establishments with respect to all types of establishments larger than 10 employed persons is observed. Micro-establishments show a negative size effect and a net positive component for the industry composition. Larger establishments have opposite components, respectively.

Table 2. Partitioned rates (%) of employment growth by size-class, 2007-2010

Growth Effect	1-9	10-19	20-49	≥50
Employment growth 2007-2010	-2.94	-1.92	-0.66	-3.17
Industry-mix	1.26	-1.07	-1.54	-1.22
Regional distribution	0.10	-0.03	-0.10	-0.13
Size	-1.92	2.07	3.77	0.97
Industry-size interaction	-0.23	-0.59	-0.47	-0.93
Industry-region interaction	0.04	-0.03	0.01	0.02
Size-region interaction	-0.02	-0.003	-0.15	0.19
Other	-0.04	-0.12	-0.04	0.07

National growth rate effect=-2.60; Allocation effect=0.46

Looking at the other size-classes, it appears that the industry-mix has a negative impact on the performance. Indeed, it seems also to drag down the otherwise positive size effect for these establishments (adding the pure size component and the industry-size interaction).

Turning to the size effect, micro-establishments seem to be affected more importantly than larger establishments, that seem to be better able to absorb the cyclical variation.

The highest positive size effects are detected for small-medium establishments, whereas for the largest establishments this effect declines (+0.97) and in combination with the industry-mix effect (-0.93) it declines almost to zero, whereas the regional effect (adding the size-region interaction effect +0.19) increases it again. It seems that the benefits due to size for large units are offset by the negative trend.

Conclusions

The paper shows that the MFP approach can be useful in analyzing size effect on employment changes. This method allows to disentangle the portions of employment change attributable to different sources, namely business cycle, size, industrial composition, regional distribution and interactions among them. Looking across different size-classes, findings show that besides national growth effect, size and industry-mix effects are crucial in explaining employment change.

The analysis highlights differential results for micro units. The bad performance of micro units (-239,468 employed persons between 2007 and 2010) is not due to their industry-mix, which is positive, but to a very negative size-class effect. These results confirm that micro-establishments are more sensitive to financial restrictions and markets shutdown during crisis periods.
Turning to large units, when looking at crude rates, they seemed to be the worst performing ones. After separating the effects, their size has a positive contribution. MFP shows that the negative performance of large economic units in terms of employment change (-132,743) is due to the national effect, an unfavorable industry composition at the beginning of the period and diseconomies of scale (industry-size interactions).

Medium-sized economic units appear to register a little decline in employment, when looking at crude rates. MFP shows that they have the highest positive size effect, and a negative industry-mix and size-industry interaction.

Deeper insights on the economic analysis and on shift share indicators are provided in the full paper.

Further research will be carried out to find confirmation of the results and further elements for the interpretation of the behaviors identified through analyzes, using data on enterprises and possibly analyses of economic performance of enterprises.

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