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1861-1981: STATISTICS TEACHING IN ITALIAN UNIVERSITIES

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1. INTRODUCTION

The choice of covering 120 years, instead of the 150 after Italian unification celebrated in 2011, has two reasons. First of all, it seems that what was published in Italy from the country's unification until the end of the 1960s provided really solid groundwork for topics in basic statistics courses. During the 1970-1980 decade there were important contributions as regards statistical inference, both according to classical and to bayesian school; however, these contributions are so technical that it is often difficult to make them part of basic teaching. Hence the theory of sampling from finite population which, due to its rapid development, found a solid establishment starting from the following decade.

Statistics teaching remained practically unchanged until the end of the Eighties, when research started to follow an increasingly "multidimensional" trend, and was supported by an extraordinary and more and more complex technological foundation.

This is how the data analysis contributions originated, leading to a new era which was no longer characterised only by software replacing the researcher's pencil and eraser, but also by a new way of thinking in line with the social developments and new needs of the time.

We propose the following example. Until that period – the end of the Seventies – quality control was associated with the manufacturing industry through the famous control charts, which were used to accept or reject a "produced item". In the Eighties, quality control extends its scope, especially to "quality evaluation" applied to university teaching, services, customer satisfaction, to mention but a few.

This new perspective deserves to be dealt with independently, and this is the second reason.

This historical overview starts from the well-known book by Melchiorre Gioja, "Filosofia della Statistica", written in 1826, 35 years before Italian unification, which paved the way for exploratory statistics and partly for the inductive approach, as well as for some probability concepts; all of these topics are part of many statistics courses. After giving a conceptual background, in section 2 men-

tion is also made of the main Italian scholars who contributed to them; the focus is limited – with a few exceptions – to the period until the end of the 1960s. Section 3 briefly describes the original features of a few Italian scholars' work which has been considered fundamental.

Section 4 contains an outline of the first books on statistics dating back to the nineteenth century and of the index of three modern books. These books were not written during the period under examination (1861-1981), however the approach they adopt is so comprehensive that they can be considered a "compendium" of the topics traditionally included in some basic statistics courses, both during the period in question and over the past thirty years, up until the year 2011. Section 5, finally, attempts to draw some conclusions.

2. STATISTICS AND MELCHIORRE GIOJA

In reading the book by Melchiorre Gioja (M.G.) of 1826 it has been discovered that the words accompanying the indices presented by the author, their interpretation and his intuitions are so perceptive that they seem to have paved the way both for traditional statistical techniques and for the most advanced. The author anticipated, no doubt in a naive way, contents which today are included in descriptive statistics, economic statistics and demography courses as an essential part of any statistics academic curriculum.

He started by introducing time series, one of the cornerstone of economic statistics, econometrics and methodological statistics whose precursor is Silvio Vianelli (AA.VV., 1987), with the methodological layout he provided in 1948. It was Luigi Vajani (AA.VV., 1987) who in the 1960s organically approached the issue, while the modern description was outlined through the ARIMA models in the Seventies.

To summarise the data, M.G. strongly emphasises the arithmetic mean which, among the numerous existing analytical means, today is the most widely used and best known, undoubtedly because it is so simple to grasp and intuitive to interpret. The arithmetic mean remains a key element in the teaching of descriptive statistics, often used together with more sophisticated generalising approaches.

The main contributions from Italian statisticians to mean values date from the early twentieth century more or less to the 1970s. Mention should be made of the research by Angelo Messedaglia of 1881 (Favero, 2006); the numerous publications by Carlo Emilio Bonferroni starting from 1924 (AA.VV., 1987); the interesting approach chosen by Oscar Chisini in 1929, which is mentioned in almost all current volumes on descriptive statistics. It is worth mentioning the perceptive work by Bruno de Finetti on associative means of 1931 and, of course, the paper by Corrado Gini of 1938 entitled "Di una formula comprensiva delle medie" which was one of the innumerable pieces of work on the subject, finally leading to the book "Le medie" in 1958. Last but not least, there was Marcello Boldrini who, in 1940, introduced the concept of "typical" mean (AA.VV., 1987). Chisini's approach was later criticised by Amato Herzel who, in 1961, replaced the simple

intuition by the former with a totally general complex articulation. The topic of averages, through extremely relevant, has been neglected for decades; today it is especially fashionable among mathematicians (Giorgi, 2011).

According to M.G., variability is an intuitive concept covering both qualitative and quantitative aspects.

The Italian contributions to this area of study started with C. Gini, in 1912, with the book "Variabilità e mutabilità. Contributo allo studio delle distribuzioni e relazioni statistiche". Its index is particularly interesting and topical for the measurement of mutability which is found in most descriptive statistics handbooks, as well as including fundamental suggestions regarding concentration. Just as important were the works by Gaetano Pietra, starting from the 1930s, by de Finetti and by Bonferroni (AA.VV., 1987).

The topic of concentration was also studied by Vittorio Castellano in 1937 and by Vittorio Amato (AA.VV., 1987) at the end of the 1940s; Mario De Vegottini at the end of the Forties and Tommaso Salvemini in 1948 (AA.VV., 1987) provided interesting insights as regards relative variability. Paolo Fortunati started studying variability in 1952, and Herzel started his work in 1967 (AA.VV., 1987).

The interest in variability continued with more intensity over time compared to that in averages: for example Giampaolo Zanardi and Vittorio Frosini contributed to the chapters on variability and concentration starting from the 1960s (AA.VV., 1987).

M.G. dealt with percentages and ratios which, depending on the case, today are defined as composition ratios, index numbers or density ratios, which became part of basic statistics and economic statistics curricula. Guido Mortara in 1913, Gini in the 1930s (AA.VV., 1987), Albino Uggè in 1942 and Carlo Benedetti (AA.VV., 1987), starting from the Sixties, were the main scholars in this area in Italy.

Ratios are essential tools also for demography, with the contributions by Gini (1912), but also by Livio Livi (1940), Mortara from 1912 to the early 1940s, Boldrini in 1956 and more recently by Bernardo Colombo (1951) and Massimo Livi Bacci (1961) who dealt with specifically demographic topics.

Moving on to the inductive section, M.G. introduces the intuitive concept of probability, which has been studied by Gini, as well as by de Finetti and Pompilj, as mentioned in the next paragraph, by Guido Castelnuovo with the first handbook on "Calcolo delle probabilità" of 1919 and by Francesco Paolo Cantelli (AA.VV., 1987) starting from the Thirties.

M.G. then introduced another intuitive concept, that of estimation. In Italy the main contributions to the point and interval estimation theory came from Luigi De Lucia, Herzel, and Alighiero Naddeo (AA.VV., 1987) in the 1960s.

A concept which according to M.G. was closely connected to that of estimation was sampling. The latter is briefly mentioned by Gini and by Luigi Galvani in 1929; however, the sampling theory officially originated with the handbook by Pompilj of 1952, and shortly afterwards with the handbook by Castellano of 1955. It was consolidated during the decade 1970-1980 with the contributions, for example, by Herzel in 1973 (AA.VV., 1995) and by Zanella in 1974 (AA.VV.,

1995) but, as already mentioned, it really gained ground only starting from the 1980s.

M.G. continuously refers to a plurality of variables one related to the other in a totally generic way, in other words considering some as the "causes" of others; this led to the concepts of connection, association, dissimilarity, co-graduation and regression, some of which have become part of basic courses. Italian authors dealing with these topics were Salvatore Bertino, Bruno Baldessari, Herzel (AA.VV., 1987) as regards connection, Giampiero Landenna in 1956 as regards dissimilarity and in 1957 as regards connection; Alfredo Rizzi analysed co-graduation, Salvemini and Giovanni Girone dissimilarity (AA.VV., 1987).

As regards regression, Gini in the 1940s, Bonferroni in 1942, Pompilj in 1946 and Amato in 1949 contributed to its development (AA.VV., 1987).

What happened to the other topics to which M.G. did not refer, for example hypothesis testing? In this field there are actually many Italian scholars who provided their contribution, especially – as already mentioned – between 1970 and 1980. Based on the criteria of mentioning only statisticians active before 1970, apart from Gini (1968) and Pompilj (1948) who criticised the significance tests, mention should be made, in strict alphabetical order of: Baldessari, Odoardo Cucconi, Mario Di Bacco, Luigi Faleschini, Landenna, Naddeo, Rizzi, Giovanni Battista Tranquilli and Michele Zenga (AA.VV., 1987).

As regards the analysis of variance, a subject which is often included in basic courses, it is worth mentioning Faleschini and Ludovico Piccinato (AA.VV., 1987), as well as many other authors, including Pompilj (1959) and Zanella (AA.VV., 1987), who dealt with experimental design.

Going back to multivariate analysis, and more specifically to data analysis, its precursors were Mario Badaloni and Rizzi, Giuseppe Lunetta, Antonino Mineo, Naddeo and Sergio Zani (AA.VV., 1987).

As already mentioned, data analysis – like other multivariate techniques and models – was fully articulated in Italy after 1980, even though already in the 1930s H. Hotelling from the US paved the way for some multivariate statistics topics related to principal components and canonical correlation analysis; this was followed in the Seventies, also in the US, by J. Tukey and in France, during the same period, by J.P. Benzécri.

Apart from the scholars already mentioned, there are many others worth quoting, who are just as well-known at national and international level for contributing to the development of statistics during the decade in question. Their contributions are collected in the "Italian Contributions to the Methodology of Statistics" (AA.VV., 1987).

As regards later periods, although they are not part of the time span covered here, mention should be made of Bruno Chiandotto for his intensive research on the teaching evaluation; this topic is extremely relevant in all Italian universities today and, in any case, it is connected with the subject of this paper.

3. ACADEMIA IN ITALY

Let us begin with short introduction about those Universities where statistics has been taught. The most ancient were Padua and Pavia, but very soon also Palermo, Rome, Naples, Bologna, Ferrara, Milan, Turin, and Florence followed suit. Statistics became compulsory in 1876 for all Law Schools, which shows how closely connected this subject was to the concept of State, with political and social connotations. The reform by Gentile, in 1923, made it no longer compulsory in Law Schools and extended it to other Faculties, for example that of Statistics in Rome.

A sad note. The Statistical Science faculty established in Rome in 1936, where the most famous teachers lectured, was closed in 2010. It was the law which forced statisticians to abdicate. The Statistical Science faculties of Bologna, Messina, Milano-Bicocca and Padua will go in the same direction.

And now let us move to a profile of four great Italian statisticians. As is well known, Corrado Gini dominated the statistics environment for the first 60 years of the twentieth century.

During his long life (he was born in 1884 and died in 1965), Gini wrote 87 books and more than 800 studies on both methodology and practice (Montanari e Monari, 2008).

He founded the review Metron in 1920; he was the founder, in 1926 – and also president – of the National Institute of Statistics, then he chaired the Italian Statistical Society created in 1939.

During Gini's presidency, this Society conducted intensive scientific work, and the president himself led the development of the whole of Italian statistics by promoting a Statistics School whose members included Pietra, Castellano and Salvemini. He addressed statistics towards concrete problems, away from mathematical technicalities, in line with what he stated in the study "Caratteristiche dei più recenti sviluppi della metodologia statistica" of 1950: "The crisis (of statistics) derives from the use of mathematics which I do not judge to be excessive, but irresponsible".

Gini, as already mentioned, gave his first contribution in 1912 by discussing variability and mutability; immediately after that came the "Appunti di statistica" of 1914, the notes from his lectures at Padua University before he moved to Rome in 1925. He was interested in exploratory statistics, an area of study to which he greatly contributed with work which over the following decades became a strength for Italian academia. However Gini started his career by studying probability, as shown by his degree dissertation entitled "Intorno alla distribuzione dei sessi nelle nascite umane" which he presented in 1905 at the Law School of Bologna University. Mention will be made here exactly of his work on probability and induction to clarify how, in spite of the many perplexities on the matter, Gini can be considered a pioneer in this respect. Regarding probabilities, his innovative publication "Considerazioni sulle probabilità a posteriori" of 1911 is unknown to most people.

Also as regards probability, he gave a truly revealing speech entitled "The dangers of statistics" on the occasion of the inauguration of the Italian Statistical So-

ciety in 1939, where he warned scholars against the unfounded logic of some procedures, thus paving the way for a systematic review of statistical methodology principles.

It should be mentioned that, at the end of the 1930s in England, Sir Ronald A. Fisher proposed a substantial number of new "statistical inference" methods which were hugely successful and caused a real revolution among researches at the time; Gini, however, was somewhat opposed to this new way of proceeding.

In 1943 there was his communication to the VI scientific meeting of the Italian Statistical Society entitled "About significance tests", and with the communication "Sigificance tests" he inaugurated the VII meeting of the Society. These studies, where direct and inverse probability dominate, clearly show his perplexities. He was also critical as regards confidence intervals. "This theory (confidence intervals) is expected to determine the probability that the error which affects an observed value is contained with an extremely high probability"; the same applies to the level of significance with the "Postilla metodologica" of 1961. The work recently done by Piccinato on Gini's criticisms to the theory of inference is very interesting (Piccinato, 2011).

However, leaving aside the perplexities expressed by Gini, it seems that inference is now the way to go. It gained ground in Europe with the growing demand from the industry, which already in 1925 led to the control charts by W. Shewhart; it gained ground also in the US during World War II when statistics was regarded as the method to solve important industrial production issues and for the success of military campaigns. Some famous protagonists of this period were: J. Neyman, E. Pearson and A. Wald.

The choice of scholars who, together with Gini, contributed to enriching statistics, has fallen – following an order based on the year of birth – on Marcello Boldrini, Bruno de Finetti and Giuseppe Pompilj. The first was a high cultured man, who approached the subject also from an epistemology perspective; the second, a man with many interests, paved the way for subjectivist probability; the third was a mathematician with a great passion for probability calculation and statistics who focused on the inference side of the statistics, also in the form of the sampling theory.

Marcello Boldrini, born only six years after Gini (he died in 1969), as part of his multifaceted activities (scholar, politician and leading figure in the oil industry) dealt with basic statistics, demography and biometrics, subjects which he started to teach in 1922 at several Italian universities, the last of which was Rome where he was appointed Professor Emeritus. Compared to Gini, he was more interested in the inductive part of statistics; indeed in 1942 he wrote the book "Statistica: teoria e metodi" where, alongside interesting and innovative interpretations of mean values, he discussed the topic of sampling theory as the first step towards induction, with specific regard to the discovery of laws in science. Boldrini, however, was not a mathematician dealing with formulae, on the contrary quite often the latter are not as justified as would be required.

He was a cultured man who, in the introduction to one of the editions of the book "Teoria e metodi della Statistica" of 1965, written with Angiolo Maros

Dell'Oro, treated epistemology; the first chapter was entitled "Science and Language"; he dealt with the question of induction from a historical-philosophical perspective; he talked about probability and statistics outlining the various approaches; he discussed natural science laws and errors. In this respect Boldrini paved the way for foundation studies on probability and statistics which many scholars then followed and which led to the introduction of ad hoc courses in some universities.

Bruno de Finetti, born in 1906 (he died in 1985), when he was only 20 published on Metron "Considerazioni matematiche sull'ereditarietà mendeliana". He conducted intensive research work, even though during the first years after his degree he did not teach. He started to work for the University of Trieste in 1939 as financial mathematician, and in 1954 he moved to Rome where he taught probability theory. His study and research on probability stands out among his numerous areas of interest. His approach to probability, radically opposed to the dominating concepts starting from the 1930s, was presented by de Finetti himself in Paris in 1935, on the occasion of five conferences at the Poincaré Institute under the title "La prévision: ses lois logique, ses sources subjectives", published in 1937. The theory was then systematised in the two volumes "Theory of probability" of 1970, translated into English for Wiley and into German for Oldenbourg Verlag.

According to de Finetti, probability is the degree of confidence that something expected might happen and prove true. In gambling terms, it is the amount one considers fair to pay in order to receive the amount "1" if the event occurs.

He was the founding father of the subjectivist school who, apart from the alternative definition of probability, based his own inference on the shift from the a priori to a posteriori through Bayes theorem; the latter's reasoning is regarded as the only way to learn from experience and very soon this school of thought became so popular that it managed to oppose with great strength the objectivist approach that had been the only dominant school until then.

The name de Finetti became well known abroad; in 1954 L.J. Savage, in his review in decisionist terms, provided a rational justification to de Finetti's inductive approach and to the decision criteria known as mean usefulness.

Giuseppe Pompilj was born in 1913. He was a geometry lecturer who had to leave the university for a long time while he was a prisoner of war. In 1948 he returned to Rome University where he taught geometry and probability calculation at the Statistical Science faculty. His greatest interest was probability theory, and in 1948 he published a book on the subject which was then used for his course. He dealt with continuous and discrete random variables, proving to be a pioneer in this respect. Of course probability was a well known subject, consider, for example, the book by Guido Castelnuovo published in 1919; however the approach adopted by Pompilj towards it was extremely modern and very close to what was happening abroad at the end of the Forties. More specifically, already at the beginning of the twentieth century, in England K. Pearson conditioned statistics towards mathematical statistics.

His life was short (he died in 1968, aged only 55) but his contribution to statistics was strong and decisive; he also studied the sampling theory, which he con-

sidered both in the modern sense of sampling from finite populations and as a tool for inference; he dealt with the analysis of experimental results, with special attention to experimental design. In order to promote statistical studies in Italy, starting from 1958 in Rome, he organised "Statistical methodology courses for researchers", to which he invited international lecturers who published their presentation in interesting books which are still referred to today because of their comprehensiveness. The cutting-edge topics of these courses were the analysis of variance and factorial designs.

Just one sentence on each of the four mentioned scholars. In the introduction to the volume dedicated to "Questioni fondamentali di Probabilità e di Statistica" of 1968, Castellano and Fortunati wrote that "Gini lead statistical methodology in various directions...but within the field of probability, his great merit is that of having refused to go ahead, when going ahead started to mean illuding himself that he had discovered the impossible and, finding the rule of indications, to mean he had transformed it into deduction".

In the dedication to his son found in the booklet called Zibaldone which Boldrini wrote in 1948, we read "It is almost an autobiographical book, because it collects the daily reflection of my passion for studies: a passion preserved over time and kept pure under all circumstances, with no concern about making sure whether it was exchanged".

In the introduction to the book "Scritti (1926-1930)" dedicated to de Finetti, Massimo De Felice wrote "almost 270 pages of dense writing, with an undeniable critical depth which, when it does not turn into expressed criticism, always remains extremely sophisticated".

"His deep and brilliant intuition and then his originality, broad mindedness, ability to extend any discussion beyond traditional levels" are the words of Giorgio Dall'Aglio in the book "Studi di probabilità, statistica e ricerca operativa in onore di Giuseppe Pompilj " of 1971.

There are two other important names, among the numerous Italian statisticians: Fortunato Pesarin who greatly contributed to statistical inference and in particular, over the past few years, to the permutation tests, and Italo Scardovi who turned his attention to the philosophical and epistemological foundations of statistics.

4. THE HANDBOOKS

As regards handbooks, a brief mention will be made of the earliest and of some current texts.

In the mid-nineteenth century at Padua University, the teaching of statistics was assigned to Angelo Messedaglia and it is from him, in a certain sense, that the Italian school of statistics started to develop. In 1872 he wrote "La statistica e i suoi metodi, suo ufficio scientifico e competenza di applicazione"; "Il Calcolo dei valori medii e le sue applicazioni statistiche" of 1883 was written while he was teaching at the University of Rome (Favero, 2006).

In the second half of the nineteenth century, several handbooks on statistics were published, such as the one by Antonio Gabaglio, lecturer in statistics at Pavia University, of 1888 entitled "Teoria generale della Statistica"(Favero, 2006). In 1906, Rodolfo Benini, whom Gini praised as "the first complete statistician in Italy", published "Principi di Statistica metodologica", only five years from the first treatise on demographics of 1901. What is really surprising is the adjective "methodological" which reminds us of method, a concept which was not known until then, showing how much statistics as a study had changed: from a subject related to the State and its population to an actual science which tries to outline the laws behind the events and provide a method for their analysis.

Apart from Benini, mention should be made of Napoleone Colajanni who in 1904 wrote "Manuale di Demografia" and in the same year "Manuale di Statistica".

Today, what is being taught in basic statistics courses is contained in three handbooks: "Statistica descrittiva" by Giuseppe Leti of 1983, "Statistica" by Domenico Piccolo in the 1998 version, and "Il campionamento statistico" by Giuseppe Cicchitelli, Amato Herzel and Giorgio Montanari in the 1992 version. The first is considered with regard to the subject of descriptive statistics, the second to statistical inference and the third to the sampling theory.

The book by Leti is really insightful, detailed and thought-provoking. In part one, after an interesting overview of the history of statistics, the main definitions are provided; part two is dedicated to the initial phases of data collection and graphic representations; in part three univariate distributions are discussed, starting with a few indices such as means medians and so on, then moving on to variability and the main indices for its measure; the author also deals with concentration with the Gini ratio and Lorenz curve, introduces some asymmetry measures by quantity and quality features, discusses index numbers and interpolation. In part four, dedicated to distributions of two or more characters, the author introduces connection, regression and correlation.

All of the concepts listed here appear, though in a greatly summarised form, in almost any book dealing with descriptive statistics; the more modern volumes sometimes discuss graphic representation differently, but certainly most of them do not touch on specific subjects such as homogeneity, dissimilarity, co-graduation, concordance, all of which were introduced in statistical literature by Gini. For example, why should students not be taught co-graduation with which to measure the attitude of two qualitative and ordinal characteristics to associate positively o negatively; or the ordinal dispersion measures for qualitative characteristic, or – also talking in qualitative terms – asymmetry. These concepts, for example, could become part of teaching evaluation, today a point of strength in the university system.

Also the book by Piccolo is comprehensive and full of examples, with references to about 600 works. After the main concepts of descriptive statistics and probability theory which constitute part two of the volume, the author introduces some basic elements to understand the random variables theory, essential for statistical inference. In part three statistical inference is mentioned, after a brief but

inevitable reference to sampling. The point estimation theory, the construction of estimators, their properties and the interval estimation theory are dealt with in a comprehensive way, always with appropriate examples.

The author then moves on to the tests following the general approach by Neyman and Pearson, considering the most widely used tests based on the likelihood ratio and non-parametric tests; finally he deals with simple and multiple regression models.

There is a chapter entitled "Further insights on statistical inference" with references to robustness, Bayesian inference, the decision theory and re-sampling methods which are not easily found in other didactic texts.

Another chapter, containing an in-depth analysis, concerns generalised linear models; this is extremely interesting and – if no ad hoc course has been introduced – it should probably be a subject taught to students. Indeed, some generalised models are now used for various disciplines, including sociology and psychology.

The volume entitled "Il campionamento statistico" is based on a famous publication by A.N. Kiaer of 1897. Italian statisticians mentioned in the references, not considering the authors themselves, are few and far between. This shows that the topic of sampling in the 1950s was dealt with by some Italian authors mainly as an introduction to inductive reasoning; as already mentioned, in Italy it started to develop only from a later date. There were other schools, more specifically the American and British one, which conducted research starting from the end of the Thirties with J. Neyman but especially with W.G. Cochran. From the 1940s onwards there were also M.H. Hansen, W.N. Hurvitz, D.G. Horvitz, D.J. Thompson and W.G. Madow. J.N.K. Rao gave a substantial contribution from 1965 to the middle of the Eighties. B. Efron in 1979 introduced the "bootstrap", while R.M. Royall and C.E. Sarndal, with many other researchers, provided essential contributions to the gradual improvement of studies on sampling.

Going back to the contents of the book, the authors systematise in an organic and comprehensive way the sampling theory from a finite population introducing several sampling designs which are *de facto* used in reality and involve constant and variable probabilities. They provide total and mean estimates for a characteristic with the usual simple random sample, which gradually becomes more complex with the stratified design, cluster approach and in two or more stages. They deal with the issue of sampling dimension and of nonsampling errors.

The book deals with more specific questions, including domains, double and repeated sampling, calibration and variance approximation methods; these are more specialised topics which can be dealt with in master's degree courses with specific reference to Statistical Science faculties.

5. CONCLUSION

In the previous paragraphs the history of the topics which are considered the foundation of statistics teaching has been outlined, mostly excluding those related

to its applications, such as economic statistics or demography, which in any case almost always accompany the former in academic courses of a statistical nature.

With a few exceptions, the focus has been on topics developed until the end of the 1970s. In particular it was noted that descriptive statistics originated already at the beginning of the period under examination and was then gradually enriched, while inference statistics, with the point and interval estimation and test theory, was introduced only later, but once consolidated it attracted the attention and interest of many researchers.

The analysis stops when technology, during the following decade, made it possible to introduce in Italy multivariate or multidimensional statistics; this is why more topical statistics subjects which are part of advanced courses will be discussed elsewhere, as will those regarding simulations or data mining, which rely substantially on the use of computers and are considered *elite* teachings in some faculties.

This short historical overview seems to prove that, in Italy, statistics has been much more highly regarded in the nineteenth century up until the beginning of the 1960s compared to the later years of the past century. On the other hand, as stated also by Castellano, in Italy statistics was considered an independent subject until the decision was made to closely follow the Anglo-Saxon approach which regarded statistics as ancillary to mathematics. This relationship, which Gini feared so much, was certainly pursued until the beginning of this century.

Only over the past five years does it seem that mathematics and statistics have found a way not only of living together, but also of collaborating within a broad multi-disciplinary view.

This is confirmed by the following words of the American mathematician Arthur Benjamin who started his presentation during a conference as follows: "If President Obama invited me to be the next Czar of Mathematics, then I would have a suggestion for him ..... I think if our students, if our high school students – if all of the American citizens – knew about probability and statistics, ...we wouldn't be in the economic mess that we're in today. ..... In summary, ... I think it would be far more significant if all of them knew what two standard deviations from the mean means".

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REFERENCES

AA.VV. (1987), *Italian Contributions to the Methodology of Statistics*, (ed) A. Naddeo, SIS, Cleup, Padova.
AA.VV. (1995), *1895-1995 100 anni di indagine campionarie,* Convegno SIS, Roma.
R. BENINI (1901), *Principi di demografia*, Barbera, Firenze.
R. BENINI (1906), *Principi di Statistica metodologica*, Barbera, Firenze.
M. BOLDRINI (1934), *Biometria e antropometria*, Giuffrè, Milano.
M. BOLDRINI (1942), *Statistica: Teoria e metodi*, Giuffrè, Milano.

M. BOLDRINI (1948), *Zibaldone,* Cisalpino, Varese.
M. BOLDRINI (1956), *Demografia*, Giuffrè, Milano.
M. BOLDRINI, A.M. DELL'ORO (1965), *Teoria e metodi della Statistica*, Giuffrè, Milano.
V. CASTELLANO (1955), *Cours de sondage, théorie et méthodes*, FAO, Roma.
G. CASTELNUOVO (1919), *Calcolo delle probabilità*, Dante Alighieri, Milano.
O. CHISINI (1929), *Sul concetto di media*, "Periodico di Matematiche", IX, 4, pp. 106-116.
G. CICCHITELLI, A. HERZEL, G. MONTANARI (1992), *Il campionamento statistico*, Il Mulino, Bologna.
N. COLAJANNI (1904), *Manuale di Demografia*, Napoli.
N. COLAJANNI (1904), *Manuale di Statistica*, Napoli.
B. COLOMBO (1951), *La recente inversione nella tendenza della natalità*, Cedam, Padova.
B. DE FINETTI (1926), *Considerazioni matematiche sull'ereditarietà mendeliana*, "Metron", 1, pp. 3-41.
B. DE FINETTI (1931), *Sul concetto di media*, "Giornale dell'Istituto Italiano degli Attuari", 3, pp. 369-396.
B. DE FINETTI (1937), *La prévision: ses lois logiques, ses sources subjectives*, "Annales de l'Institute H. Poincaré", 7, pp. 1-68.
B. DE FINETTI (1970), *Teoria della probabilità*, Einaudi, Torino.
B. DE FINETTI (1981), *Scritti (1926-1930)*, Cedam, Padova.
B. EFRON (1979), *Bootstarp methods: another look at the jackknife*, "The Annals of Statistics", 7, pp. 1-26.
G. FAVERO (2006), *La statistica nell'Università italiana: manuali e libri di testo dal 1848 al 1922*, Dipartimento di Scienze Economiche, Università Ca' Foscari, Venezia.
C. GINI (1911), *Considerazioni sulle probabilità a posteriori*, in Statistica e induzione, Statistica LXI supplemento, CLUEB, Bologna.
C. GINI (1912), *I fattori demografici dell'evoluzione delle nazioni*, Fratelli Bocca, Torino.
C. GINI (1912), *Variabilità e mutabilità: Contributo allo studio delle distribuzioni e relazioni statistiche*, Studi Economico-giuridici dell'Università di Cagliari, pp. 1-159.
C. GINI (1914), *Sulla misura della concentrazione e della variabilità dei caratteri,* "Atti del Reale Istituto Veneto di Scienze, Lettere e Arti", LXXIII, pp. 1203-1248.
C. GINI (1915), *Appunti di statistica*, La Litotipo, Padova.
C. GINI, L. GALVANI (1929), *Di una applicazione del metodo rappresentativo all'ultimo censimento italiano della popolazione*, "Annali di Statistica", 4, pp. 1-107.
C. GINI (1938), *Di una formula comprensiva delle medie*, "Metron" XIII, 2, pp. 3-22.
C. GINI (1939), *Variabilità e concentrazione*., Memorie di metodologia statistica, Giuffrè, Milano.
C. GINI (1939), *I pericoli della Statistica*, in Statistica e induzione, Statistica LXI supplemento, Clueb, Bologna.
C. GINI (1943), *A proposito dei testi di significatività*, in Statistica e induzione, Statistica LXI supplemento, Clueb, Bologna.
C. GINI (1943), *I testi di significatività*, in Statistica e induzione, Statistica LXI supplemento, Clueb, Bologna.
C. GINI (1950), *Caratteristiche dei più recenti sviluppi della metodologia statistica*, in Statistica e induzione, Statistica LXI supplemento, Clueb, Bologna.
C. GINI (1958), *Le medie*, UTET, Torino.
C. GINI (1961), *Postilla metodologica*, in Statistica e induzione, Statistica LXI supplemento, Clueb, Bologna.
C. GINI (1968), *Questioni fondamentali di probabilità e di statistica*, Vol 1, 2 Università di Roma La Sapienza e Università di Bologna.
C. GINI (2001), *Statistica e Induzione*, Statistica LXI supplemento, Clueb, Bologna.
M. GIOJA (1826), *Filosofia della Statistica*, Edizione 1937 Ruggia &C, Lugano.
G.M. GIORGI (2011), *Corrado Gini: the man and the scientist*, "Metron", LXIX, 1, pp. 1-28.

A. HERZEL (1961), *Sulla definizione di concetti di media e di interpolazione*, "Metron" XXI, 1-4, pp. 126-138.
A.N. KIAER (1897), *The rappresentative methods of statistical survey*, Ufficio centrale di Statistica della Norveglia, Oslo, Anno 1976.
G. LANDENNA (1956), *La dissomiglianza*, "Statistica", XII, 1 pp. 25-57.
G. LANDENNA (1957), *Osservazioni sulla connessione*, "Statistica", XIII, 4, pp. 351-391.
G. LETI (1983), *Statistica descrittiva*, Il Mulino, Bologna.
L. LIVI (1940), *Trattato di demografia: leggi naturali della popolazione,* Cedam, Padova.
M. LIVI BACCI (1961), *L'immigrazione e l'assimilazione degli italiani negli Stati Uniti secondo le statistiche demografiche americane*, Giuffrè, Milano.
A. MONTANARI, P. MONARI (2008), *Gini's contribution to Multivariate Statistical Analysis*, "Statistica", LXVIII, 3-4, pp. 239-254.
G. MORTARA (1912), *Sulle variazioni di frequenza di alcuni fenomeni demografici rari*, "Annali di statistica", IV.
G. MORTARA (1913), *Numeri indici delle condizioni economiche dell'Italia*, "Giornale degli economisti".
L. PICCINATO (2011), *Gini's criticism to the theory of inference: a missed opportunity,* "Metron", LXIX, 1, pp. 101-117.
D. PICCOLO (1998), *Statistica*, Il Mulino, Bologna.
G. POMPILJ (1948), *Teoria statistica della significatività e conformità di risultati sperimentali agli schemi teorici*, "Statistica", VIII, 1.
G. POMPILJ (1952), *Teoria dei campioni*, Veschi, Roma.
G. POMPILJ, G. DALL'AGLIO (1959), *Piano degli esperimenti*, Edizioni Scientifiche Einaudi, Torino.
G. POMPILJ (1964), *Le variabili casuali*, Istituto di Calcolo delle Probabilità, Università di Roma La Sapienza, Edizione 1983.
G. POMPILJ (1971), *Studi di probabilità e statistica e ricerca operativa in onore di Giuseppe Pompilj*, Università degli Studi di Roma La Sapienza, Roma.
A. UGGÈ (1942), *Lezioni di Statistica economica. Il significato, la costruzione e l'uso dei numeri indici dei prezzi*, Giuffrè, Milano.

SUMMARY

1861-1981: Statistics teaching in Italian universities

This paper aims to outline the development of Statistics from 1861 to 1981 with respect to its contents. The paper pays particular attention to some statistical topics which have been covered by basic introductory courses in the Italian Universities since the beginning of the Italian unification. The review takes as its starting point the well-known book "Filosofia della Statistica" of Melchiorre Gioja. This volume was published 35 years before Italian unification but it already contains the fundamental topics of exploratory and inductive Statistics. These topics give the opportunity to mention Italian statisticians who are considered the pioneers of this discipline. In particular, the attention is focused on four statisticians: Corrado Gini, well-known for its modern insights; Marcello Boldrini, high cultured man also in the epistemological field; Bruno de Finetti, founder of subjective school and Bayesian reasoning; Giuseppe Pompilj, precursor of random variables and sampling theory. The paper browses the indexes of three well-known Italian handbooks that, although published after the period 1861-1981, deal with topics covered in some basic teachings of exploratory statistics, statistical inference and sampling theory from finite population.