HISTORY AND ITS METHODS

MATHEMATICAL STATISTICS AND INFORMATICS IN ROMANIAN HISTORIOGRAPHY

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Long before mathematical statistics and computers made their entry into the history field, editing and commenting unpublished statistic sources were a traditional preoccupation in historiography, as well as the starting point for quantitative research.

Many Romanian historians have meticulously and strenuously labored to publish censuses or reports containing statistical data collected during the pre-statistical period, i.e. before 1859.[1]

Building statistical data series by juxtaposing (concatenating) information obtained from different, not necessarily statistic, sources is specific to the quantitative historical research. In that vein were developed the statistical series regarding the tribute paid to the Ottoman Empire[2], the taxes in Wallachia in the sixteenth century[3], monetary circulation in Wallachia and Moldavia in the sixteenth century[4], Transylvania's commerce with the Romanian provinces[5], the price evolution in the fifteenth-eighteenth centuries[6], the domanial exploitation in Wallachia in the eighteenth century.[7]

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[1] *Dezvoltarea economiei Moldovei între anii 1848 şi 1864,* ed. by V. Popovici, C. C. Anghelescu, L. Boicu, Bucureşti, 1963; *Din istoria statisticii româneşti. Culegere de articole,* ed. by M. Mănescu, Constantin Ionescu, M. Biji, Bucureşti, 1969.

[2] Mihai Berza, *Haraciul Moldovei şi Ţării Româneşti în sec. XV–XIX,* in "Studii şi Materiale de Istorie Medie," vol. II, 1957, pp. 7-47.

[3] Damaschin Mioc, *Cuantumul birului pe gospodărie ţărănească în Ţara Românească în secolul XVI,* ibidem, vol. V, 1962, pp. 151-173.

[4] Mihai Maxim, *Considérations sur la circulation monétaire dans les Pays Roumains et l'Empire Ottoman dans la seconde moitié du XVIème siècle*, in "Revue des Etudes Sud-Est Européennes," t. XIII, 1975, no. 3, pp. 407-415.

[5] Ruxandra Cămărăşescu, Coralia Fotino, *Din istoria preţurilor. Evoluţia preţurilor cailor în Ţara Românească (secolele XV–XVII),* in "Studii şi Materiale de Istorie Medie," vol. VI, 1973, pp. 225-241; Ioana Constantinescu, *Din istoria preţurilor în Ţara Românească în secolul al XVIII-lea până la 1775,* in "Revista de Istorie," t. 29, 1976, no. 12, pp. 1927-1943.

[6] Radu Manolescu, *Comerţul Ţării Româneşti şi Moldovei cu Braşovul (secolele XIV–XVI),* Bucureşti, 1965; Lidia Demény, *Le commerce de la Transylvanie avec les régions du sud Danube effectué par la douane de Turnu Roşu en 1685,* in "Revue Roumaine d'Histoire," t. VII, 1968, no. 5, pp. 761-777; Ludovic Demény, *Comerţul de tranzit spre Polonia prin Ţara Românească şi Transilvania (ultimul sfert al secolului al XVII-lea),* in "Studii. Revistă de istorie," t. 22, 1969, no. 3, pp. 465-498.

[7] Sergiu Columbeanu, *Grandes exploitations domaniales en Valachie au XVIIIème siècle*, Bucarest, 1964.

By simply counting the data that appeared nominally, not quantified, in the original sources, historians have built, for example, statistics about property and family evolution in the fifteenth-eighteenth centuries, or about the human dwellings in Wallachia in the fourteenth-sixteenth centuries.

In the same line of work, an interesting quantitative analysis of Romanian historiography has resulted from the collaboration of two historians, a Romanian and a German.[8]

The mathematical apparatus of all these works was very simple, limited to the computation of sums, ratios, or averages.

The Anglo-Romanian conference "Mathematics in History and Archeology" that took place in 1970 in Mamaia, under the auspices of the Royal Society of London and of the Romanian Academy, made possible the close contact of a vast number of historians, archeologists, mathematicians and programmers, who approached a diversity of practical or theoretical aspects of this field of interdisciplinary research.[9] The year 1970 was marked by this conference as the starting point of the Romanian preoccupation with the application of mathematics and computers in history. Another factor that stimulated the researchers' interest in the new methodologies was professors Grigore Moisil and Mircea Malița's inciting lectures.

As a consequence of this tendency of renewal and modernization of historical research, a small team of researchers at "Nicolae Iorga" Institute of History in Bucharest began to investigate the possibility of applying quantitative methods in history. The team comprised Vasile Liveanu (coordinator), Constanța Moței (documentarist), and Irina Gavrilă (statistician).

They first concentrated on problems of social-economic history of the early-twentieth century, trying to develop mathematical models for the sharecropping system, establishing the determinant factors of the peasant lease, and analyzing the factors that determined the order and intensity of the peasant revolt of 1907.[10]

In the second half of the nineteenth century, after the 1864 land reform, capitalist development and modernization made big advances. On the large agrarian properties, diminished but not eliminated by the reform, the capitalist relations, i.e., the paid labor, developed. At the same time, sharecropping continued to exist.

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[8] Robert Deutsch, W.H. Schröder, *Quantitative Analyse der Rumänischen Historiographie*, Köln, 1976.

[9] *Mathematics in the Archaeological and Historical Sciences*, Edinburgh, 1971.

[10] Vasile Liveanu, Ligia Asănăchescu, C. Lulea, Constanța Moței, Viorica Medeleanu, *Matematica și știința istoriei. Factori determinanți ai variațiilor arenzii țărănești la începutul secolului XX în România,* in "Studii," vol. XXIV, 1971, no. 2, pp. 307-332; Vasile Liveanu, Irina Gavrilă, Constanța Moței, *Statistică matematică și istorie. Despre ordinea declanșării mișcărilor țărănești în 1907,* in "Revista de istorie," t. 33, 1980, no. 9, pp. 1697-1736.

After 1864, the big landowners leased a part of their land to the peasants, who used their own tools and seeds to work the land. The rent was usually paid in corn, the peasant giving the landowner a part of the crop, and also performing other tasks on the landowner's land, with his tools.

In the second half of the nineteenth century, the rent paid by the peasants increased greatly. Discovering the determinant factors of this rent variation could contribute to the creation of a theory of the sharecropping system, which was predominant in the nineteenth-twentieth centuries in the East-European countries, and which still exists in some developed countries. With this goal in mind, the small research team analyzed the correlation between a variable called "the lease" and approximately 200 other variables considered indicators of the economic, social, demographic, and cultural situation of the 32 districts of Romania. These indicators and their correlation to "the lease" variable were the basis of a sharecropping model.

The American sociologists D. Chirot and Ch. Ragin were the first to apply the methods of mathematical statistics to the study of the peasant revolt of 1907, and they showed their results in the paper *The Market Tradition and Peasant Rebellion. Case of Romania in 1907*, published in the "American Sociological Review." They tested the various ideas issued in western literature regarding the factors that caused the peasant revolts by using the correlation coefficients, and they reached useful conclusions on the 1907 revolt. However, their study has a methodological flaw – they start from a unique model of the peasant revolts. Moreover, they do not fully use the rich documentary sources and data regarding the situation of the Romanian peasantry and agriculture at the beginning of the twentieth century.

In contrast with the American sociologists, we (the "Nicolae Iorga" team) decided to follow the reverse path. We did not start from a general model of all peasant revolts to test it and see if it also covered the 1907 revolt. Instead, we started with the analysis of the factors that influenced the 1907 revolt, and then we tried to see if this analysis was consistent with any of the general models.

Thus, firstly we did not limit ourselves to testing a small number of factors borrowed from a general model, but we tried to verify the role of the largest possible number of factors, from which we retained only those that had the greatest influence on the 1907 revolt. Secondly, we tried to capitalize on the entire existing documentation in order to quantify the aspects of the 1907 revolt.

The analysis of the rank correlation gave us the ability to measure the influence of different factors by replacing the subjective opinions or contradictory, albeit logical, arguments by precise computations.

By applying this methodology, it was shown that the production relations influenced the peasant revolts directly, not only through the land distribution or the size of the lease imposed on the peasants, but also through the entire system of

sharecropping, through the social-economic backwardness, and through some geographic and cultural factors.

The value of applying the statistical methods to history resides, we believe, not only in their novelty or sophistication, but mainly in the degree to which the selected method is appropriate to the historical problem at hand, be it an old method or a new one, a simple or a complex one.

In that sense, an interesting experiment was the application of non-parametric statistical methods to several series of lacunar historical data, as they were preserved since the Romanian Middle Ages.[11]

In contrast with the traditional methods, the statistical inference gives the researcher the ability to establish, with a controlled risk of error, whether the available data are representative, and to draw generalizations, even though they are incomplete. Often confronted with small samples, actually what was left from historical documents, the historian draws generalizations mostly based on intuition or unverified assumptions. Statistical tests help to verify these assumptions, and also to establish whether the available lacunar data can tell us anything about the entirety of the data they come from. In this way, the uncertainty of the generalizing conclusions is diminished, which is a real gain for historical science.

From the point of view of a historian's productivity, especially regarding the research time spent in routine, almost mechanical operations, the most efficient application of the computer in historical research is, we believe, the creation and management of historical databases with numerical and/or non-numerical data. We created and used such databases to research the quantitative changes in the boyars class by the abolishment of ranks for an important number of great boyars families before the reform of the prince Alexandru Ioan Cuza, disappearance due to their replacement by individuals originating from other families than those of big landowners of 1864.[12]

These research projects have the advantage that some of their by-products, such as various lists of names with various kinds of information attached and sorted by various criteria, can be used in other studies, for example in biographical ones.

We could also cite among the social-economic historical preoccupations the thorough analysis of the credits attested/recorded in the register of treasury of the ruling prince Constantin Brâncoveanu (1688–1714).[13] This source, although exhaustive for the time period it covers (1694–1703), has information only about

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[11] Vasile Liveanu, Irina Gavrilă, *Mathematics in History. The Study of Historical Time Sequences with Missing Data*, in "Revue Roumaine d'Histoire," vol. XIX, 1980, no. 1, pp. 22-46.

[12] Iidem, *The Computer and Non-Numerical Information. On the Evolution of the Class of Landlords in Romania (1857–1918),* in "Historical Social Research," vol. 13, 1988, no. 1, pp. 75-89.

[13] Irina Gavrilă, Bogdan Murgescu, *Credit şi creditori în timpul lui Constantin Brâncoveanu,* in "Revista de istorie," vol. 41, 1988, no. 9, pp. 862-876.

debt repayment, and almost nothing about the conditions in which the loans were contracted.

We analyzed different credit types, the monthly and annual debt repayment evolution, their correlation to the tribute to the Ottoman Empire and to the political and military situation, the imperfect character of the financial markets even in the big Ottoman cities. Finally, our study tried to evaluate the role and consequences of the massive demand for external credits.

The trend towards quantitative research in Romanian historiography has included studies of catagraphies and census records as well, as they are very rich sources of demographic, economic, and genealogical data.

The quantitative analysis of the boyars census performed in Wallachia[14] is a true radiography of the Wallachian dominant class in its last phase of legal existence, as the 1858 Paris Convention had abolished the ranks and privileges in the Romanian Principalities. The study presents statistics of the places of birth of the boyars, their geographic and social mobility, and their wealth. Actually, we created an extremely important database, as it reflects the precise situation of the dominant class of Wallachia at the end of the third decade of the nineteenth century.

Romania has been very active also in the domain of genealogy, through the Commission of Genealogy and Heraldry, working within the "Nicolae Iorga" Institute of History. The statistical methods and automatic data processing have produced promising results in this domain as well.

An interesting analysis was performed on the composition of the set of families of higher boyars in Wallachia in the eighteenth century. The study focused on the 37 families of Romanian boyars, as well as on 8 foreign families already Romanized in the eighteenth century and on 44 foreign families holding the highest ranks in Wallachia at that time.[15]

This study was extended to the quantitative analysis of the families that occupied the second and third class ranks during the Phanariote time. The research clearly established that the Romanian dominant class was constantly predominant, without affecting the interesting historical interconnection of the three categories holding political power: the Romanian boyars, the Romanized boyars, and the Greek-Phanariotes.[16]

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[14] Dan Berindei, Irina Gavrilă, *Analiza situaţiei clasei dominante din Ţara Românească în temeiul catagrafiei din 1829,* ibidem, vol. 36, 1983, no. 4, pp. 350-362; Iidem, *Mutaţii în sânul clasei dominante din Ţara Românească în perioada de destrămare a orânduirii feudale,* ibidem, vol. 34, 1981, no. 11, pp. 2029-2046.

[15] Iidem, *Analyse de la composition de l'ensemble des familles de grands dignitaires de la Valachie au XVIIIème siècle*, in vol. *XV Congreso Internacional de las Ciencias Genealógica y Heráldica,* vol. I, Madrid, 1983, pp. 239-254.

[16] Iidem, *Considération sur les dignités de seconde et troisième classes en Valachie au XVIIIème siècle. Le problème de la pénétration gréco-phanariote*, in vol. *Actas do 17 Congresso Internacional das Ciêcias Genealógica e Heráldica,* Lisabona, 1986, pp. 49-62.

Another study targeted the analysis of the same dominant class of Wallachia by the automatic processing of the Catagraphy of Bucharest of 1810–1811.[17]

Yet another study of the archondologies of Wallachia and Moldavia, corroborated with the Parliamentary Annals of 1837–1858, led to the creation of an important database on the boyars of Wallachia in the time of the Organic Regulations.[18]

The Laboratory of Historical Demography, created in 1982 at "Nicolae Iorga" Institute of History at the behest of the Academician Ştefan Ştefănescu, has stimulated the efforts to apply the tools of the new methodology to this field as well. We can mention, for example, the research on the structure of the Bucharest population at the time of the Union of the Principalities[19], or during the War for Unification of Romania (1916–1918)[20], as well as the complete image of the same population rendered by a statistical analysis of the Catagraphy of Bucharest of 1810–1811.[21]

The trend towards quantitative research in Romanian historiography stimulates the preoccupations regarding the methodology, the particularities and the difficulties encountered in the correct usage of statistical methods in historical research. Different and interesting points of view were formulated during the international debates of Bucharest (1980), Washington (1982), and Bellagio (1984).

Research projects such as *Statistical Laws Versus Historical Laws*, *Non-parametric Statistical Methods in the Historical Research* or *Statistical Methods and Computerized Historical Data Processing*[22] have tried to clarify aspects related to the peculiarities of the documentary material and bring out the particular importance of quantitative data for historical research. The computer assisted statistical analysis of such data can lead to conclusions sometimes unavailable to the traditional methods, given the huge volume of historical information. We have

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[17] Paul Cernovodeanu, Irina Gavrilă, *Clasa boierească în catagrafia oraşului Bucureşti (1810–1811),* in "Revista Arhivelor," 1991, no. 1, pp. 33-60.

[18] Iidem, *Consideraţii istorice pe marginea datelor statistice oferite de Arhondologiile din Ţara Românească (1837–1858),* in "Revista istorică," t. VI, 1995, nos. 7-8, pp. 683-699; Iidem, *Arhondologiile Ţării Româneşti de la 1837,* Brăila, 2002; Mihai-Răzvan Ungureanu, *Marea Arhondologie a boierilor Moldovei (1835–1856),* Iaşi, 1997.

[19] Şerban Rădulescu-Zoner, Irina Gavrilă, *Cu privire la structura populaţiei oraşului Bucureşti în epoca Unirii Principatelor,* in "Revista de istorie," 1984, no. 1, pp. 47-62.

[20] Iidem, *Date privind populaţia oraşului Bucureşti în anii războiului de întregire a României (1916–1918),* ibidem, 1987, no. 7, pp. 692-700.

[21] Paul Cernovodeanu, Irina Gavrilă, *Catagrafia oraşului Bucureşti din 1810–1811,* in "Revista istorică," t. I, 1990, pp. 706-723.

[22] Irina Gavrilă, *Metode statistice şi prelucrare automată în exploatarea informaţiei istorice,* Bucureşti, 2002.

to take into account the fact that a historian is often confronted with incomplete numerical data, whose repartition function is hard to establish. In these cases, the ill-fitted application of statistical methods may lead to erroneous, inconsistent results. There are statistical methods for the study of the association between historical phenomena and methods of statistical inference which, properly adapted to the particularities of historical information, can be applied to lacunar historical data as powerful tools to generalize upon samples of data found in the archives.

Researchers must guard themselves against the tendency of dressing up their subjective opinions in arbitrary "numerical clothes," without an objective justification, tendency that has nothing to do with the scientific, quantitative evaluation of the historical phenomena.

The past ten years of quantitative historical research in Romania were dominated by the very up-to-date tendency towards building and managing large historical databases. The work already cited, *Arhondologiile Ţării Româneşti de la 1837*, is a precious tool for further social history research.

The nominal records of those who received land according to the 1864 Rural Law – a very rich documentary material – were the input for a valuable historical database, which completed the information in the 1837 catagraphy of Wallachia.[23]

Studies and articles concerning various subjects linked with the Romanian computer assisted historical research were published in the past years. The Internet as a tool for documenting and editing[24], the prospects and pitfalls of quantitative history[25], the graphic form of historical analysis[26], the design and management of historical databases[27], the application of computers in prosopography[28], and the editing on the Internet are some of the present main research directions.

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[23] Eadem, *Baze de date istorice. Marea proprietate funciară potrivit matricolelor nominale ale locuitorilor împroprietăriţi prin Legea rurală din 1864,* Bucureşti, 2005.

[24] Eadem, *Internet ca instrument de documentare şi editare,* in "Studii şi Materiale de Istorie Modernă," vol. XVII, 2004, pp. 169-180.

[25] Eadem, *Perspective şi capcane în istoria cantitativă,* in vol. *Identitate naţională şi spirit european. Academicianului Dan Berindei la 80 de ani*, ed. by Ştefan Ştefănescu, Florin Constantiniu, Dorina Rusu, Bucureşti, 2003, pp. 85-102.

[26] Eadem, *Reprezentările grafice în analiza statistică a datelor istorice,* in vol. *Închinare lui Petre Năsturel la 80 de ani*, ed. by Virgil Cândea, Paul Cernovodeanu, George Lazăr, Brăila, 2003, pp. 817-825.

[27] Irina Gavrilă, *Principii metodologice în designul bazelor de date istorice,* in vol. *Faţetele istoriei. Existenţe, identităţi, dinamici. Omagiu academicianului Ştefan Ştefănescu*, ed. by Tudor Teoteoi, Bogdan Murgescu, Şarolta Solcan, Bucureşti, 2000, pp. 611-622; Eadem, *Consideraţii asupra proiectării şi gestionării bazelor de date istorice,* in vol. *Istorie şi societate. Culegere de studii de istorie modernă şi contemporană*, ed. by Constantin Buşe, Ileana Căzan, 2000, pp. 450-462; Ileana Căzan, Irina Gavrilă, *Decoraţiile din România modernă (1877–1916). Rezultatele prelucrării unei baze de date,* in "Studii şi Materiale de Istorie Modernă," vol. XV, 2002, pp. 125-148.

[28] Irina Gavrilă, *Cercetarea prosopografică asistată de calculator,* in "Revista Istorică," vol. XIII, 2002, nos. 3-4, pp. 245-260.

Eager for real dialogue and a continuous exchange of ideas and opinions with all those interested in this new domain, the Romanian researchers have had the initiative of creating the International Commission for the Application of Quantitative Methods to History in 1980, at the 15th International Congress of Historical Sciences of Bucharest. The commission's vice-president was Dr. Vasile Liveanu, senior researcher at the "Nicolae Iorga" Institute of History, until his death in 1987.

Quite comforting is also the increasing interest in the new methodology shown by the young researchers and students from the Department of History of the University of Bucharest. The early, isolated lectures of mathematical statistics and informatics have become a well-structured course, which, unfortunately, lacks a specially developed manual or the technical infrastructure.

The powerful impact of computers on virtually all the domains of scientific research has certainly brought a renewal in the activity of the Romanian historians. The ubiquitous presence of computers, the Internet, and computerized libraries have undoubtedly changed the thinking of the most traditionalist researchers in the historical science. Research programs of highest priority for Romanian historiography, such as the processing of the 1838 Census report of Wallachia, or the history of population, or of prices, will not be possible without applying the statistical methods and the automatic processing to the extremely rich documentary sources.

Eager to join the international quantitative history community and convinced of the usefulness of a continuous exchange of opinions and comparative studies of various schools of quantitative history, we hope that our short presentation of the main research topics of the Romanian cliometry will arouse the interest of all those who make use of this fast evolving methodology.