ROBERT A. HORVÁTH

Epistemology and Methodology in the Social Sciences: The Case of Statistical Discipline

I. The origin of the modern social sciences,[1] from an epistemological point of view, has been an extremely complex and difficult process. In the history of these sciences, there is certainly no lack of tentative interpretations emanating from the history or sociology of science or even — although less frequently — from philosophy or epistemology itself. In spite of these efforts, however, our knowledge in this field has remained limited. Consequently, this paper is not intended to provide a kind of general synthesis relating to epistemological and methodological problems of the statistical discipline; rather, the aim is to raise some of the fundamental questions that arose during the formation of this discipline. The development of statistics as a discipline which has taken just over 300 years represents a scientific history which exceeds and precedes that of modern sociology itself. In our opinion, the course of development covered by statistics in its scientific history and especially its rivalry with modern scientific sociology in the 19th century provides interesting parallels; and even an inventory of its epistemological and methodological problems can yield examples illustrative not only of sociology, but of the social sciences in general.

II. The formation of modern statistics was closely linked with the birth of modern capitalism.[2] The latter was superimposed on the dissolution of small economic units which were self-sufficient and feudal in character and the dissolution of the social framework including the administration of medieval society. The advent of capitalism gave rise to bigger economic units, new classes and big, centralized states, and the mass phenomena which were emerging became increasingly inaccessible by the traditional sciences and disciplines. This difficulty and at the same time this necessity led to the emergence at around 1660 of the first two versions of the new discipline of statistics, the Political Arithmetics[3] in England and the "Staatenkunde"[4] in Ger-

[1] MARX, K.: Theorien über den Mehrwert, Stuttgart, 1905, Vol. 1, p. 2 and note 1). The manuscript of this paper dates from 1861 and 1863.

[2] Ibid. in the same sense.

[3] HORVATH, R. A.: Essays in Political Arithmetics and Smithanism, Acta Universitatis Szegediensis, Juridica et Politica, Vol. XXV. Fasc. 4, Szeged, 1978. (Monograph)

[4] By the SAME AUTHOR: Le Développment de l'École de Statistique Allemande, Acta Univ., Szegediens., Jur. et Pol., Vol. XXVIII. Fasc. 2., Szeged, 1981. (Monograph)

many, both on a socio-scientific basis since their primary aim was the explication of the new economic, demographic, social and political realities.

One of the most famous analysts of economics, Joseph Alois SCHUMPETER, in rewriting the history of economic thought under the methodological aspect of the development of economic analysis,[5] underlined the triple condition of the formation and establishment of all new social sciences, namely that every new science must find its own subject and its own method so that it can be distinguished from all other sciences and, thirdey as SCHUMPETER insisted, there must be some form of self-identification, that is to say, it should express its diversity by way of a specific and unique designation. It seems clear, however, that besides this third condition — that of underlining the „differencia specifica" vis-à-vis the other sciences or disciplines — there is a fourth, essential requirement which orients every new discipline in the opposite direction, that is to say, toward establishing its „genus proximum", its relation with the other sciences in the final interpretation and explanation of its system of paradigms and in the conclusions resulting form it, established by the new discipline.

This is what is generally called the „scientific theory" of the new discipline which is closely linked not only with fundamental suestions including method and subject, but also with the neighbouring disciplines and at the same time with the fundamental problems that occur in all sciences — to put it briefly, with philosophy and epistemology proper, and with the theory of knowledge.

III. When comparing the first two versions of the statistical discipline mentioned above with the insights manifest in the conditions established by SCHUMPETER, one finds, in their parallel development, differences and coincidences which are both characteristic and instrutive. The delimination of the subject seems to be considerable; but this difference is more imaginary than real on the basis of a profound analysis — while that which presents itself in the area of methodology remains wholly fundamental in character. The method of political arithmetics was already quite similar to the future discipline of unified statistics which developed from the activities of QUETELET in the 19th century and, in turn, the method of the description of the States could not yet separate from the methods of medieval philosophy.

As far as the questions of the new statistical disciplines are concerned, the political arithmetics has found the latter within the framework of the new mass phenomena of emerging English capitalism, by the investigation of phenomena and characteristics relating to pouplation, in particular mortality, and by the economic life, consumption, foreign trade, production, budgetary and monetary policy and, at the same time, by the problems of a new society which was developing around these phenomena. The political arithmeticians were interested in the state only as the political organisation of the new society in the form of a national and centralized state which promoted colonization as well as commercial wars, that is to say the most powerful sources of the accumulation of capital and wealth in this particular respect. Thus, the political arthmeticians were also confronted with the question of "par excellence" of descriptive statistics, i. e., the question of the comparison of rival

[5] SCHUMPETER, J. A.: History of Economic Analysis, Edited from manuscript by BOODY—SCHUMPETER, E., 3rd Ed., New York, 1959, p. 242.

states in terms of their wealth, their power, and all their stengths and weaknesses to enable an estimation of national potential in the competition of great powers, established or potential.

The concept of the description of the German States established by CONRING, which emerged at the same time, referred only to the most important European States, not in order to study their rivalries, but to describe their stage of development. Since the development of capitalist economy in Central Europe was considerabliy lagging behind and capitalist society had yet to be born, the absolutist enlightened State was the sole agent of the imposed capitalist transformation, and it is understandable that this centralized and powerful organization completely stifled the imagination of the descriptive statisticans. As to their method, it took a long time to separate from late medieval philosophy as represented by Aristotelianism which was firmly rooted in the German universities. Initially — and this is a crucial point — the description did not use figures, only qualitative, comparative and superlative terms, stating that such and such a State was "sparsely populated", "more populated", or "densely populated" and the same method was practised in comparing other characteristics, resources and so on. This method — as I have recently shown — had not yet detached itself from the universality of the medieval scientific method, and it hardly differed from the descriptive method of the natural sciences despite its subject which was clearly social.[6]

In order to arrive at the quantitative method, that is to say, using figures in the explanation of social realities, nearly a century of development was necessary within this branch of the statistical discipline in Germany. It was only the founder of the more developed description of States, Professor ACHENWALL of Göttingen, who initiated this development in 1749; but the process was not brought to a conclusion until half a century later, around the turn of the 18th and 19th centuries. His successor, Professor SCHLÖZER, finally recognized the identity of this method with that of political arithmetics. I have already shown that the realization of this great change was facilitated for ACHENWALL by the pioneering work of Professor SCHMEIZEL, his predecessor[7] — but, what is more interesting — I have also found that even the founder and pioneer of political arthmetics, PETTY, was not without knowledge of this rival concept, that is to say, the description of States. The proof of this is, no doubt, the definition of his method which was quite new and going back to the 1670s, and containing the basic constituents of "the" future statistical method. It should be noted that he did not only define this method in positive terms — but also contrasted it with the method of the description of States, when PETTY wrote in his "Political Arithmetick" that:

> „The method I take to do this, is not yet very usual; for instead of using *only comparative or superlative words, and intellectual arguments,* [underlined by the author of the present essay] I have taken the course (as a specimen of political arithmetick I have long

[6] HORVATH, R. A.: Aux Sources de la Statistique Allemande, Annales de Démographie Historique, 1979, pp. 157 and further — and by the SAME AUTHOR: Linné et Schlözer — Some new Aspects of the Critique of the Descriptive Statistical School, Statisztikai Szemle, 1978, No. 10, pp. 1018 ff. (In Hungarian with summaries in Russian and English.)

[7] BY THE SAME AUTHOR: An unpublished manuscript of (Kőrösy on Martin Schmeizel, Demográfia, 1970, No. 1—2, pp. 86ff. In Hungarian with English summary.

aimed at) to express myself in terms *of number, weight, or measure* [underlined by PETTY]; to use only arguments of sense and to consider only such causes, as have visible foundations in nature, etc., etc."[8]

One has to aknowledge the perspicacity of this ingenious and prescise parallel from the point of view of method and epistemology, confronted with the late medieval scholasticism in its version represented by CONRING.

It should be noted that this fundamental difference between the specific method of the two new branches of the statistical discipline becomes even wider, if one takes into account a traditional element of the methodology which PETTY in his above definition simply ignored. I am referring to the pioneering use of probability calculus in political arithmetics, a major innovation which in the last decade of the 17th century existed within this current, represented by the smoothing of data on a probabilistic basis by HALLEY who worked out the famous life table. Two decades later, by way of an inversion of the theorem of JACQUES BERNOULLI, the political arithmeticians were able to apply the law of large numbers in the statistical estimation of large entities with a law of unknown distribution. Even so, the possibilities which were opened up by this field of mathematical science and its application in statistics were not exploited in a systematical and deliberate manner until the rise of the first *Grande Ecole Française des Probabilités* — as represented by LAPLACE, FOURIER and POISSON — and their famous astronomer student who later became a statistician, QUETELET.[9]

We still have to look at the problem of self-identification of the two versions of the statistical discipline — how it is reflected in the denomination of the two parallel branches. It seems that their social orientation was without ambiguity — a fact which also follows from the terms used to define these twin disciplines. During his initial doubts — while trying to designate the new discipline of which he considered himself the founder — PETTY tried to capture its nature by the term of "political anatomy". According to him, it represented the skeleton of a new economic and social system. Eventually he changed his mind and firmly introduced the term of "political arithmetics", a term which at the same time denotes the specific method of this discipline: the political arithmetics analyses real phenomena whereas mathematical arithmetics involves imaginary entities. Thus, PETTY has incorporated this discipline into the emerging social sciences and most specifically into that science which has become the most important one since MACHIAVELLI, political science.[10]

[8] The Economic Writings of Sir William Petty, Edited by HULL, C. H., Reprints of Economic Classics, New York, 1967, and HORVATH, R. A.: The Contribution of Netherlandish Thinking to the Formation of Statistics as an Autonomous Discipline, Proceedings of the 36th Session of the International Institute of Statistics, Syney, 1967, Vol. XLII, 2nd. Ed., 710 ff. with a Summary in French.

[9] HORVATH, R. A.: Quetelet et la Statistique et son Epoque Acta Univ. Szegediens., Jur. et Pol., Vol. XXIII, Fasc. 3, Szeged, 1976, (Monograph)

[10] BY THE SAME AUTHOR: The Centenary of the "Capital" of Marx and the Statistical Science, Statisztikai Szemle, 1967, No. 1080ff., and especially 1089ff. with reference to MARX, K.: Critique of Political Economy, written in 1859, where he is considering PETTY both as founder of the modern Political Economy and Statistics. (In Hungarian with Russian and English summaries.)

In his version of German desriptive statistics CONRING used the Latin expression "Notitia Rerum Publicarum" and then, in the same sense, the German term "Staatenkunde" or "study of States". The importance of the State as institution is already reflected in this definition — which seems to imply and incorporate a methodological position — to know that the method of this new discipline has to be identical with that of the political sciences — that of law or the history of the State, with politics or the philosophy of the State: i.e., with a qualitative, historical, and speculative method in which mass phenomena can only play a subordinate and passive role.

The more developed version of this branch of German descriptive statistics — against the background of the discovery of the importance of figures in the emergence of new mass phenomena in a State — came to be known under a general term, and used in the universities where the courses of this new discipline were called "vulgo statistica." The term which was invented by ACHENWALL was derived both from the Italian word "lo stato" and the German word "Staat", and for some time took the more general form of "Statistik." These designations of the description of States — and this is common knowledge — were always both designations of the "subject" and the "discipline." For this reason, another German designation was also in use at the time of ACHENWALL — the word "Staatsverfassung" of the States or empires. In a strict sense, this expression designated the system of the constitutional law of the State; but in a wider sense, adopted by the cameralists, it came to be used for designating the structure of the State, i.e., complete with its administrative and financial laws as well as its economic, demographic, and social structure.

This term "Verfassung" — if one does not confine it to the State and includes within it an entire society — is identical with PETTY's political anatomy and pointing at the same time to the growing convergence of the two branches of the statistical discipline in the second half of the 18th century. SCHLÖZER's famous late medieval formula deliberately linked the economic, demographic, and social resources — "Vires" — to the constitutional system — "Unitae" — and to the administrative system — "Agunt." This third part of the description of the State which was extended to cover an entire capitalist society was the exclusive subject of QUETELET's statistical discipline after he had abandoned the two other parts which were of a more legal nature, the legal constitution and the state administration.[11]

The Göttingen School, which constituted a real "school" or "sect" in the physiocratic sense of the word, has additionally contributed to the scientific establishment of the statistical discipline by elaborating and delineating the place occupied by it in the system of sciences which were established during the second half of the 18th century. The result was identical with the views of PETTY on this point. Notably ACHENWALL as much as SCHLÖZER later on, regarded the more developed and numerical version of the description of states as a discipline of practical politics — an "ars" rather than a "scientia politica." It is this discipline, which makes it possible to survey the present State and the structure of mass phenomena and furnishes a deepened knowledge of the State from an economic, demographic and social point of view. It follows that the development of principles und theoretical theses of political

[11] BY THE SAME AUTHOR: op. cit. under 4).

science is impossible without it or, at least, remains remote from social reality. If, in line with this thinking — "statistics" only designate that part of the discipline of "practical politics" which, above all, utilizes the numerical method in the social sciences, it establishes — at least in principle — the identity of this current and the Political Arithmetics as used by PETTY. The consequences of this development, i. e., the convergence of the two branches of statistics, were acknowledged by QUETELET only two decades later, and this marked the beginning of a new period in the history of statistics — not without important repercussions on epistemology in general.

IV. As an astronomer, QUETELET began his statistical activities under the influence of the Grande Ecole Française des Probabilités and, in this way, he turned to the social sciences and became the founder, the "father" of the modern and unified statistical discipline. His scientific preoccupations, however, remained mathematics and physics — which is further illustrated by his only essay on a subject of scientific history, i. e., the development of these two disciplines in the Netherlands. QUETELET has incorporated into this mathematical science as applied to society, what he considered to be „the" modern statistics, the entire tradition of political arithmetics and probability calculus as well as the valid results of the German "Staatenkunde". The latter were reinforced by the practice of statistical offices which were introduced by Napoléon around the turn of the 18th and 19th centuries and benefited from the pioneers of statistics in France half-way between Political Arithmetics and the German descrption of States.[12] In these offices, which were a kind of statistical manufacture, the procedures of compilation and elaboration of the statistical material as well as the methods of elementary calculations were developed and formed the basis of a technique which facilitated the building of an infrastructure of scientific tenets. This task was also accomplished by QUETELET who was one of the experts in the official statistical service of his country, the Netherlands, and later Belgium.

It was QUETELET who, in 1835, carried away with a real "statistical enthusiasm"[13] developed the first version of the method of this modern discipline under the title "Sur l'Homme et le Développement de ses Facultés ou Physique Sociale." In this work, as far as methodology is concerned, the amalgamation of the application of probability calculus and modern statistical technique — suited for collecting and processing a large quantity of reliable material handled by the offical statistical services — was present in its essential form. A methodological exposé, however, was published by QUETELET only in 1846 in a monograph entitled "Lettres sur la Théorie de la Probabilité Appliquée aux Sciences Morales et Politiques". In this work, the founder of the modern statistical discipline has taken pains to describe the role of probability calculus or, more precisely, of the law of large numbers in the identification of collective characteristics of "human" faculties — representing "the population" and not "the individual."

According to his thinking, these characteristics derive from physical and

[12] BY THE SAME AUTHOR: The Development of Statistics in France with special regard to Hungarian Statistics, Acta Univ. Szegediens., Jur. et Pol., Vol. XIV. Fasc. 4, Szeged, 1967. (Monograph in Hungarian and summaries in French and English)

[13] Expression used by WESTERGAARD, H.: Contributions to the History of Statistics, London, 1932.

social regularities which are named "general causes" in the context of which the effect of individual acts is neutralized and effaced as a result of "aleatory causes." The result implies a determinism in the "social body" and allows the free-will to play a role only within the individual sphere. In my essays which focus on the personality and works of QUETELET, I have taken trouble to show that in the methodological conception of QUETELET, the supposition that all the distributions in sufficiently large numbers and all sample errors which are more or less representative converge toward the normal law, was not exclusive, despite the fact that his epigones have interpreted the application of this law rather in this mistaken direction.[14]

A recent article on this subject has underlined the ambiguous nature of QUETELET's work, even in the second edition of "Physique Sociale"[15] which, to be fair, was mainly due to a crisis brought on by a stroke in 1855 and to QUETELET's scientific outlook, which remained practically unchanged from that time on. The same unfinished character can be discerned about QUETELET's work in relation to the subject and theory of the new, modern statistical discipline, which, even during QUETELET's lifetime, provoked heated controversies, especially over a new rival science which was baptized "sociology" by COMTE. It is a known fact that the latter had the intention to call this scientific system "Physique Sociale" and that, after the publication of QUETELET's work in 1835, he felt obliged to change his orginal idea.[16] QUETELET made a considerable effort to give a precise definition of the subject and the theory of that super-science of man, the structure of which had in some way to replace the social theory of modern statistics which was still showing deficiencies. The result was his essay "Du Système Social et des Lois qui le régissent", published in 1848. The theme was the whole of mankind with all its physical or demographic — and moral — faculties, in the sense of the moral or social sciences, as well as its intellectual, i.e., philosophical faculties. Thus, his theory led to the establishment of his new quantitative social laws, despite the fact that QUETELET was aware that imponderabilia existed which defied the utilization of this method. He was resolved, however, to identfy "l'anatomie" or "la physique" of the social body with that abstract social "man" whose essential feature was conservation, if not perpetuation, corresponding to the celestial mechanics in the physical world which QUETELET also observed scientifically in his capacity as an astronomer. It remained up to future statisticians to consider this conception which was both too ambitious and too confused, and decide how to develop the major areas of statistics and how to classify it within the scientific system so as to make clear its double nature — at the same time firmly attached to the social sciences, but progressing steadily toward a universal method — with severe epistemological consequences.

Before going into this further phase of development of the modern statistical discipline, it seems opportune, at this stage of my paper, to underline

[14] HORVATH, op. cit. under 9).

[15] LÉVY, P. M.: Quetelet et la Sociologie Contemporaine: l'Illusion Mathématique, Mémorial Adolphe Quetelet, No. 4, Adolphe Quetelet 1796—1874, Contribution en Hommage à son Rôle de Sociologue, Bruxelles, 1977, 100ff.

[16] FREUND, J.: Quetelet et Comte, ibid. pp. 46ff. especially pp. 48ff, — and Adolphe Quetelet, l'Oeuvre Sociologique et Démographique, Choix de Textes par LEBRUN, M., Un Dossier du Centre d'Etudes de la Population et de la Famille, Bruxelles, 1974, pp. 45ff.

that one of the most neglected areas in the scientific and epistemological history has been and still is a comparative analysis of the ideas of QUETELET and COMTE with respect to the differences and agreements of their methodology, the subject and theory of the social supersciences which they conceived in the shape of "Physique Sociale" and "Sociologie," respectively. While there are lucid comparisons from this point of view, between QUETELET and MARX and between COMTE and MARX, we still do not have a comprehensive analysis of the two systems of QUETELET and COMTE from this particular angle, namely that of epistemology. In this context, Raymond ARON writes in his introduction to "Etapes de la Pensée Sociologique" that one can assert, not without solid arguments though, that today's empirical and quantitative sociology "owes more to Le Play and Quetelet than to Montesquieu and Auguste Comte"[17], and he finds that even the efforts of LAZARSFELD mentioned by him were undertaken by departing from the requirements of sociology rather than from those of statistics.[18] Is it necessary to class the attempt by QUETELET among the "partial" explications of the "totality" of social phenomena, compared with that of COMTE as ARON did in the same work: the ideas of COMTE were "global" according to him and more dogmatic than empirical, thereby excluding the study of social probabilities — perhaps with special regard to QUETELET?[19] The debate on this question can be expected to continue for a long time to come. If one acknowledges, however, — always in line with the interpretation of COMTE's system by ARON — that this author who was both a sociologist and philosopher wanted to synthesize all analytical sciences in a sociological convergence leading to a "sociology of knowledge"[20], the new elements of the theory of knowledge should be represented in his system and among them those of the new mathematical-statistical logic, by establishing, through this method, a new epistemology which is more universal than social.

It is to this problem that we have to direct our attention before finalizing the first approximation to this subject of vital importance — laying aside the interesting task of establishing numerous convergences between the systems of QUETELET and COMTE which existed despite a fundamental methodological difference and despite the quasi-identy of the subject as well as in spite of a difference in the final interpretation, which was theological rather than scientific, of the theory of knowledge on the part of QUETELET.[21]

V. QUETELET died in 1874 and the development of the statistical discipline during the last one hundred years was marked by a separation between a "mathematical statistics" and statistics known as "non-mathematical" which occurred during the last decades of the 19th century. The protagonists of

---

[17] ARON, R.: Les Estapes de la Pensée Sociologique, Paris, 1967, Introduction, p. 16, — and ibid. with reference to LAZARSFELD, P.: Notes on the History of Quantification in Sociology, ISIS, Vol. LII, 1961, p. 304ff.

[18] See op. cit, under 15), 16), and 17).

[19] ARON, R.: op. cit, p. 120.

[20] Ibid., p. 121.

[21] Ibid., p. 123, — where ARON is referring to the "réligion sociologique" of COMTE — which corresponds to the line of the present essay as the one possible extreme, the other one being the position of ÖTTINGEN, A.: Die Moralstatistik und die christliche Sittenlehre, Versuch einer Sozialethik auf empirischer Grundlage, Erlangen 1868—73, 3rd. Ed.: Die Moralstatistik in ihrer Bedeutung für eine Sozialethik, ibid., 1882.

non-mathematical statistics wanted to retain the socio-scientific character of this discipline and they wanted to prevent the application of highly mathematical methods and probability calculus which had become increasingly complicated. The statisticians who were called mathematical have developed them to a growing extent in the areas of scientific application — whether in the social or natural sciences, such as in demography and agriculture, — but particularly in the pure sciences — natural or exact — such as experimental and theoretical physics or pure mathematics. The law of TCHEBITSCHEFF formulated in 1867[22], with its more general interpretation of the law of large numbers, facilitated the birth and the triumphant advance of the sampling method which became important in political economy and American sociology.

Toward the end of the last century, in 1898, BORTKIEWITZ formulated the law of small numbers which marked the beginning of the objective interpretation of probabilities and of the reformulation of the law of large numbers by LAPUNOV on this basis.[23] The verification of this achievement was impossible before the era of computers but it already exerted a decisive influence on the methodology in the mathematical statistics between the two Wars, and especially after the Second World War. A first application of "statistical laws" in the physical sciences by PLANCK, in 1918, followed immediately in the still theoretical research on quanta, but shortly after, when it had reached the experimental stage, it successfully led to atomic research.[24] This single example demonstrates "ad oculos" the immense importance of mathematical-statistical methods leading to the actual state of our knowledge. The concept of "stability" even in the exact sciences was thus overturned. This decisive step in statistics was already taken toward the last decade at the 19th century when PEARSON established the seven basic types of statistical distributions where normal distribution was only a special case among others. With their interferences and multiple combinations, the extraordinary variety of the universe of statistical masses became manifest and became also one of the generating forces of the development of statistical and mathematical methods, aiming at the treatment of the interdependence, either aleatory or causal. The explosion of the correlation theory was only one aspect of this development, the variety required an increasingly rapid analysis of continuity in time and its modeling by smiplified schemes or models.

However, the statistical models of reality showed themselves to be increasingly complicated as their investigation became more thorough. Thus, toward the end of the twenties, a double-faced discipline was created, half-way between statistics and political economy under the name of "econometrics" which preferred to utilize increasingly dynamic and more advanced statistical and mathematical methods containing an increasing number of variables. Even the structure and the dynamics of causality were modelled, the most famous example of which were the MARKOV chains. A similar development took place in demography after the Second World War and the outcome is known as "pure demography" or "démometrie."[25]

[22] HEYDE, C. C. — SENETA, E.: J. J. Bienaymé, Statistical Theory Anticipated, New York — Heidelberg — Berlin, 1977.

[23] Ibid.

[24] PLANCK, M.: Akademische Aussprachen, Göttingen, 1948. with a cumulative list of his publications.

[25] WINKLER, W.: Demometrie, Berlin, 1969, pp. 20ff.

At the same time, an important development occurred in the area of subjective probability. The students of BAYES in the 20th century, by the extension of his theory, paved the way for the formation of the so-called "Bayesian statistics" which provided the basis of a decision-making theory which in turn has enriched statistical methodology.[26]

The results of the development of mathematical statistics — a development which at the same time accelerated and grew in its dimension — have led to a situation in which it is almost impossible, even for specialists, to grasp its current complex state. Old and new ideas and methods have been interchanged and mixed to such an extent that the scientific constructions which have resulted from them are becoming more and more sophisticated. The growing utilization of computers and the particular problems involved in this have multiplied the theoretical and practical questions relating to the use of these new methods.

VI. However, instead of losing ourselves in details, the most important epistemological consequences should, at least briefly, be recalled to mind. The most significant of them is certainly the growing difficulty of interpreting the results of current computations and statistical methods, both partial or global. These difficulties are multiplied in case of analysis of a social science subject whose nature — sometimes almost intractable — today troubles even high-powered statisticians. We shall only mention two well-known names, MORGENSTERN and JOHN NEUMANN.[27] Their line of thinking which they represented in statistical epistemology, pure as well as economic, was followed up in demographic statistics by HAUSER, DUNCAN and SPENGLER.[28]

The doubts and efforts shown by numerous experts have led directly to the recognition of the importance to be attached to the problems of the theory of statistical knowledge and of epistemology on the one hand, and that of the inevitableness of an ultimate interpretation of all statistical knowledge from the point of view of the social sciences on the other. This ultimate double-faced character of all statistical knowledge — apart from its "pure" or proper epistemological methodological character — still exists and is inseparably linked with the "political" nature of all human knowledge in connection with the social body. Thus, it is no coincidence that recently there have been a growing number of voices in this direction, in the most developed mathematical statistics, that of the United States, as for instance is expressed by KISH of the American Statistical Association in his presidential address, or the views of CHOUCRI — as concerns the demographical statistics.[29]

VII. The importance of statistical epistemology as well as the general idea behind this brief essay is not only shared by today's sociologists following the

[26] HOULÉ, A.: L'Arbre Généalogique des Bayesiens, Special Document No. 81—105 of Laval University, Québec, 1981 pp. 7ff.

[27] MORGENSTERN, O.: On the Accuracy of Economic Observations 2nd Ed., Princeton, 1963 — v. NEUMANN, J.: Collected Works, I—VI, London — New York, 1963.

[28] HAUSER, Ph. M. — DUNCAN, O. D.: The Nature of Demography, The Study of Population, Edited by HAUSER, Ph. M. and DUNCAN, O. D., Chicago, 1959, pp. 29ff. and SPENGLER, J. J.: Economics and Demography, ibid., pp. 791ff.

[29] KISH, L.: Chance, Statistics and Statisticians, Presidential Address, Journal of the American Statistical Association, 1978, No. 371, pp. 1ff and CHOUCRI, N.: Political Implication of Population Dynamics, World Population Plan of Action, Vol. II, New York, U. N., 1975, Part 9, pp. 606ff.

pioneering activities of LAZARSFELD and others[30], but is particulary felt in the world of university teaching in many countries. The conviction is gaining ground that the teaching of statistics, as a method of knowledge and thought, is indispensable to the understanding of a world full of mass and probabilistic phenomena in which we are now living nearing the end of the 20th century. This knowledge is indispensable, not only on the level of advanced and specialized teaching, but also on the secondary and general and even primary levels. This requirement is a realistic one and, in adopting it, "a fortiori" an extra scientific effort will have to be made for the clarification and establishment of a coherent system of statistical methods as an integral part of the theory of knowledge, be it philosophical, mathematical and "pure", be it social or "political" in its connections with the epistemology of the general or specialized social sciences — among them sociology in particular.

Only a profound understanding acquired at all levels of teaching can bring about a recognition of the fundamental dualism of our world and existence which is full of interdependence of causal and aleatory phenomena, resulting in a complex "game" of chance and human willpower, in one word: in life itself.

[30] See also: Mathematical Thinking in the Social Sciences, Edited by LAZARSFELD, P. F., 2nd rev. Ed., Glencoe, 1955, — and STONE, R.: Mathematics in the Social Sciences and other Essays, London, 1966.