Faculty of Economics and Administration Masaryk University

Literární rešerše

Jan Přikryl
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1 Primární zdroje

D. Bernoulli

Exposition of a New theory on the Measurement and of Risk[1]
Ve svém díle se autor zaobírá například tím, jakou hodnotu pro nás mají další nabyté peníze. Dále řeší vztah rizika ztráty vzhledem k jednotlivcům, případně i pravděpodobnost výhry.

Cournout

Exposition de la theorie des chances et des probabilites[2]
Obsáhlé Cournotovo dílo na téma pravděpodobnosti, rizika (hazard) a jejich aplikace. Cournot pravděpodobně nesprávně aplikoval některé metody (Bayes vs. Bernoulli) viz. Ibid. 2.

Edgeworth

Metretike, or the method of measuring probability and utility
V tomto díle autor rozvíjí své názory na měření a měřitelnost pocitů, víry a pochybností ve vztahu k pravděpodobnosti.

F. Knight

Risk, Uncertainty and Profit

Petty?

Political Arithmetic[3]

[1] Ibid. Figure 4.1
[2] Ibid. Figure 4.4
[3] Ibid. Figure 4.1

Graunt?

Natural and Political Observations Made upon the Bills of Mortality[4]
Statistika aplikovaná na tehdy dostupných datech(bill of mortality).

E. Halley?

An Estimate of Degrees of Mortality of Mankind[5]
Pokus o odhad vlivů působících na mortalitu na základě pozorování porodnosti a úmrtnosti ve městě Vratislav.

J.P. Sussmilch?

Die gottliche Ordnung in den Veranderungen des menslichen Geschlechts ... [6]

Laplace?

Theorie analytique des probabilites[7]

Venn?

Logic of Chance[8]

A. Quetelet

Lettres a S.A.R. le duc regnant de Saxe-Coburg et Gotha, sur la theorie des probabilites, appliquee aux sciences morales et politiques[9]

J. & N. Bernoulli?

Ars Conjectandi

2 Sekundární zdroje

H. L. Westergaard

Contributions to the History of Statistics[10]
Bohužel jsem tuto knihu nenašel.

J. A. Schumpeter

History of Economic Analysis

Stephen M. Stigler

The History of Statistics: The Measurement of Uncertainty Before 1900
Zajímavá kniha pojednávající podrobněji o Edgeworthovi, Cournotovi. Obsahuje i několik dalších jmen, především však z oblasti matematiky.

[4]Ibid. Figure 4.1
[5]Ibid. Figure 4.1
[6]Ibid. Figure 4.1
[7]Ibid. Figure 4.4
[8]Ibid. Figure 4.4
[9]Ibid. Figure 4.5
[10]Ibid. Figure 4.1

Anders Hald

History of Probability and Statistics and Their Applications before 1750
Další z knih pojednávajících spíše o statistice. Podrobněji rozebírá Graunta, obsahuje také jména jako Halley. Poslední kapitola knihy je věnována matematice pojišťování podle Moivrea a Simpsona.

Andrew I. Dale

A History of Inverse Probability: From Thomas Bayes to Karl Pearson, 2nd edition
Především matematický rozbor pravděpodobnostních přístupů. Obsahuje jména jako Edgeworth, Cournot nebo Quetelet.

3 Ostatní zdroje

Nassim Nicolas Taleb

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W.A. Deming

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W.A. Shewart

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Keynes

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G.L.S. Shackle

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Nassim Nicolas Taleb

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F.P. Ramsay

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Bruno de Finetti

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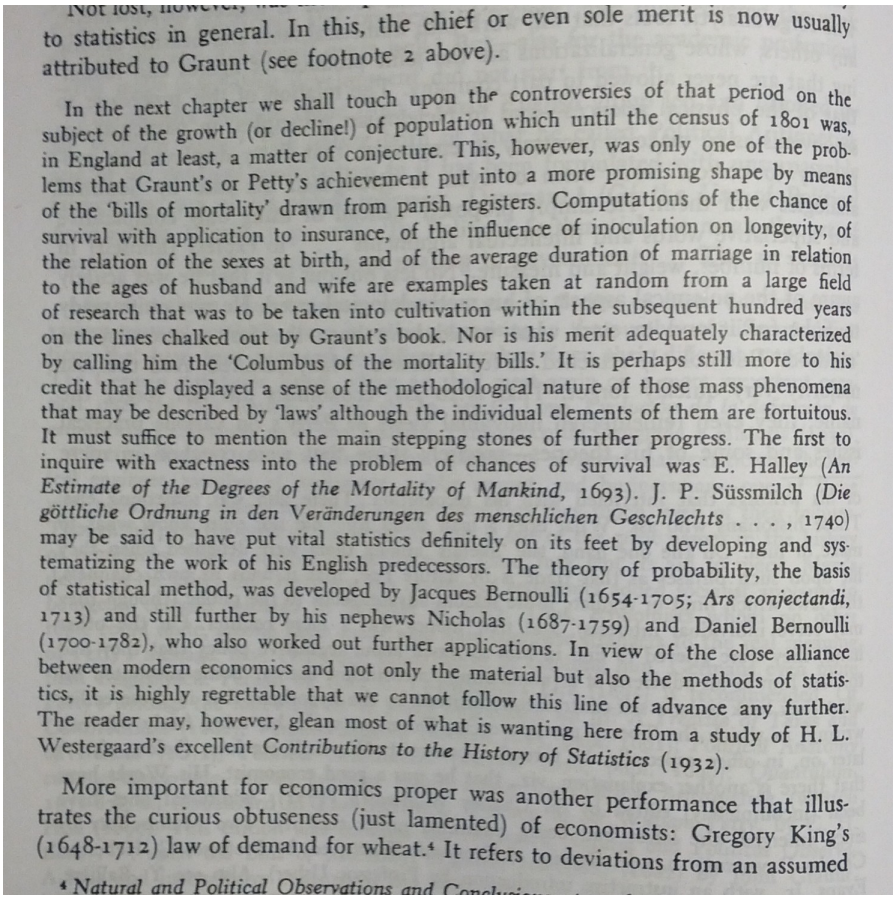
4 Přílohy



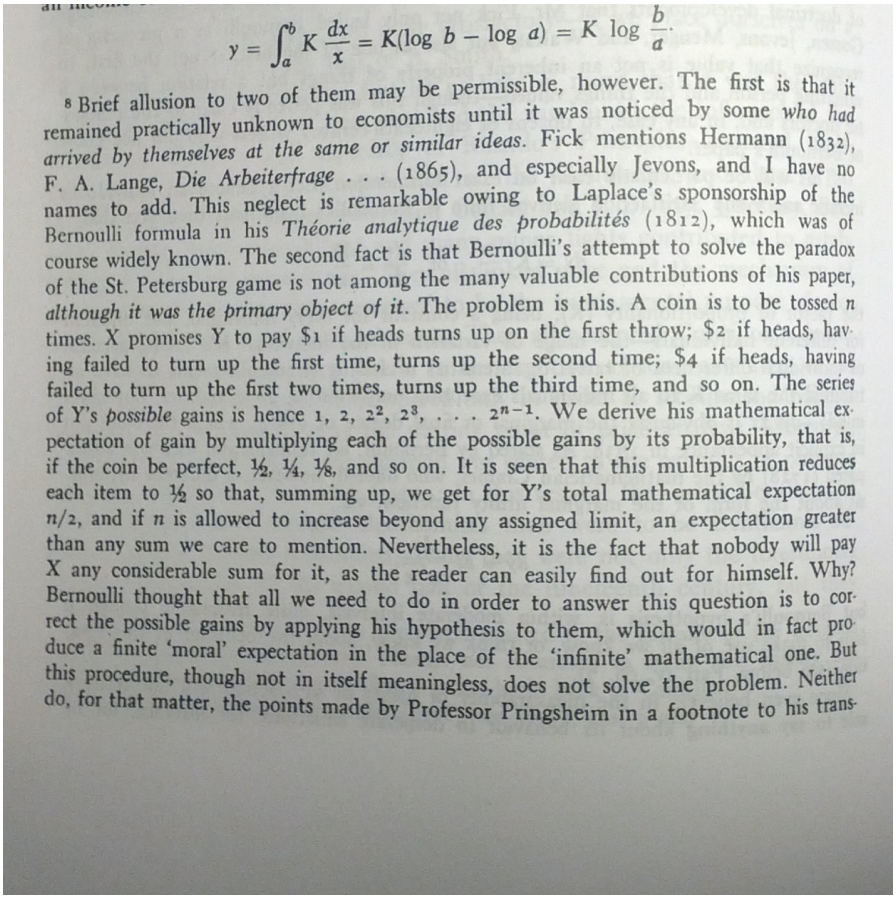
Not lost, however, [illegible] to statistics in general. In this, the chief or even sole merit is now usually attributed to Graunt (see footnote 2 above).

In the next chapter we shall touch upon the controversies of that period on the subject of the growth (or decline!) of population which until the census of 1801 was, in England at least, a matter of conjecture. This, however, was only one of the problems that Graunt's or Petty's achievement put into a more promising shape by means of the 'bills of mortality' drawn from parish registers. Computations of the chance of survival with application to insurance, of the influence of inoculation on longevity, of the relation of the sexes at birth, and of the average duration of marriage in relation to the ages of husband and wife are examples taken at random from a large field of research that was to be taken into cultivation within the subsequent hundred years on the lines chalked out by Graunt's book. Nor is his merit adequately characterized by calling him the 'Columbus of the mortality bills.' It is perhaps still more to his credit that he displayed a sense of the methodological nature of those mass phenomena that may be described by 'laws' although the individual elements of them are fortuitous. It must suffice to mention the main stepping stones of further progress. The first to inquire with exactness into the problem of chances of survival was E. Halley (*An Estimate of the Degrees of the Mortality of Mankind*, 1693). J. P. Süssmilch (*Die göttliche Ordnung in den Veränderungen des menschlichen Geschlechts . . .*, 1740) may be said to have put vital statistics definitely on its feet by developing and systematizing the work of his English predecessors. The theory of probability, the basis of statistical method, was developed by Jacques Bernoulli (1654-1705; *Ars conjectandi*, 1713) and still further by his nephews Nicholas (1687-1759) and Daniel Bernoulli (1700-1782), who also worked out further applications. In view of the close alliance between modern economics and not only the material but also the methods of statistics, it is highly regrettable that we cannot follow this line of advance any further. The reader may, however, glean most of what is wanting here from a study of H. L. Westergaard's excellent *Contributions to the History of Statistics* (1932).

More important for economics proper was another performance that illustrates the curious obtuseness (just lamented) of economists: Gregory King's (1648-1712) law of demand for wheat.[4] It refers to deviations from an assumed

[4] *Natural and Political Observations and Conclusi[illegible]*

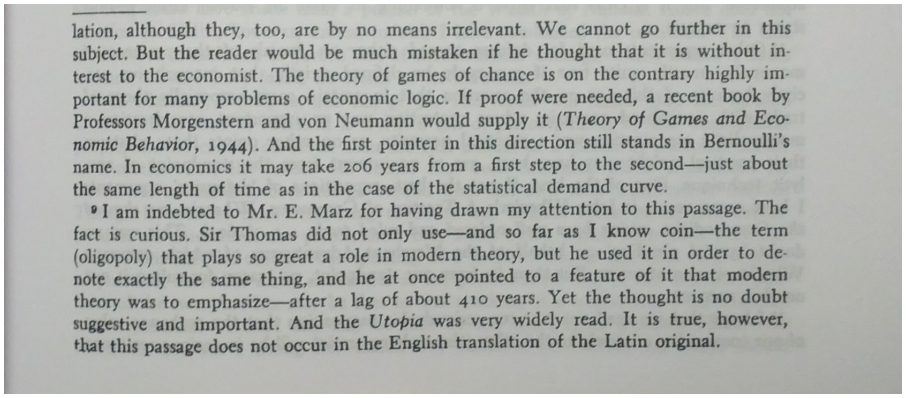
Figure 4.1: J. A. Schumpeter *History of Economic Analysis*



$$y = \int_a^b K \frac{dx}{x} = K(\log b - \log a) = K \log \frac{b}{a}.$$

[8] Brief allusion to two of them may be permissible, however. The first is that it remained practically unknown to economists until it was noticed by some *who had arrived by themselves at the same or similar ideas*. Fick mentions Hermann (1832), F. A. Lange, *Die Arbeiterfrage* . . . (1865), and especially Jevons, and I have no names to add. This neglect is remarkable owing to Laplace's sponsorship of the Bernoulli formula in his *Théorie analytique des probabilités* (1812), which was of course widely known. The second fact is that Bernoulli's attempt to solve the paradox of the St. Petersburg game is not among the many valuable contributions of his paper, *although it was the primary object of it*. The problem is this. A coin is to be tossed n times. X promises Y to pay \$1 if heads turns up on the first throw; \$2 if heads, having failed to turn up the first time, turns up the second time; \$4 if heads, having failed to turn up the first two times, turns up the third time, and so on. The series of Y's *possible* gains is hence $1, 2, 2^2, 2^3, \ldots 2^{n-1}$. We derive his mathematical expectation of gain by multiplying each of the possible gains by its probability, that is, if the coin be perfect, ½, ¼, ⅛, and so on. It is seen that this multiplication reduces each item to ½ so that, summing up, we get for Y's total mathematical expectation $n/2$, and if n is allowed to increase beyond any assigned limit, an expectation greater than any sum we care to mention. Nevertheless, it is the fact that nobody will pay X any considerable sum for it, as the reader can easily find out for himself. Why? Bernoulli thought that all we need to do in order to answer this question is to correct the possible gains by applying his hypothesis to them, which would in fact produce a finite 'moral' expectation in the place of the 'infinite' mathematical one. But this procedure, though not in itself meaningless, does not solve the problem. Neither do, for that matter, the points made by Professor Pringsheim in a footnote to his trans-

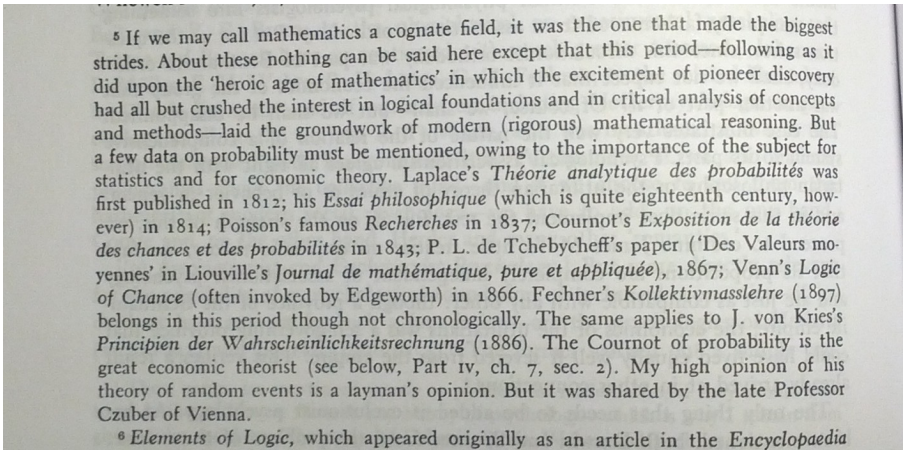
Figure 4.2: J. A. Schumpeter *History of Economic Analysis*



lation, although they, too, are by no means irrelevant. We cannot go further in this subject. But the reader would be much mistaken if he thought that it is without interest to the economist. The theory of games of chance is on the contrary highly important for many problems of economic logic. If proof were needed, a recent book by Professors Morgenstern and von Neumann would supply it (*Theory of Games and Economic Behavior*, 1944). And the first pointer in this direction still stands in Bernoulli's name. In economics it may take 206 years from a first step to the second—just about the same length of time as in the case of the statistical demand curve.

[9] I am indebted to Mr. E. Marz for having drawn my attention to this passage. The fact is curious. Sir Thomas did not only use—and so far as I know coin—the term (oligopoly) that plays so great a role in modern theory, but he used it in order to denote exactly the same thing, and he at once pointed to a feature of it that modern theory was to emphasize—after a lag of about 410 years. Yet the thought is no doubt suggestive and important. And the *Utopia* was very widely read. It is true, however, that this passage does not occur in the English translation of the Latin original.

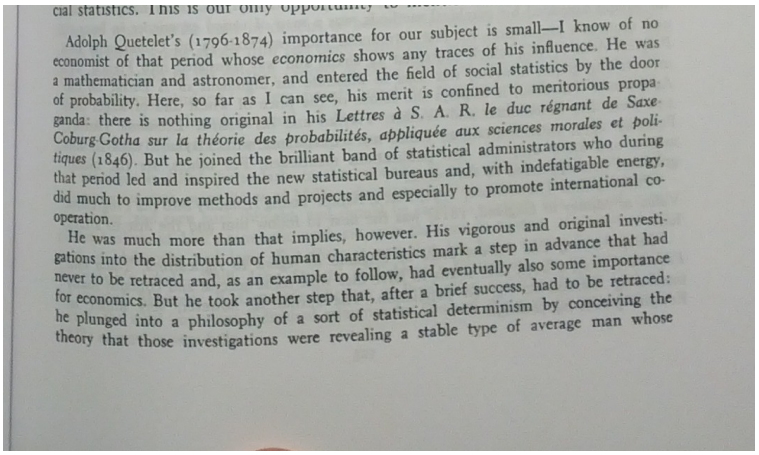
Figure 4.3: J. A. Schumpeter *History of Economic Analysis*



[5] If we may call mathematics a cognate field, it was the one that made the biggest strides. About these nothing can be said here except that this period—following as it did upon the 'heroic age of mathematics' in which the excitement of pioneer discovery had all but crushed the interest in logical foundations and in critical analysis of concepts and methods—laid the groundwork of modern (rigorous) mathematical reasoning. But a few data on probability must be mentioned, owing to the importance of the subject for statistics and for economic theory. Laplace's *Théorie analytique des probabilités* was first published in 1812; his *Essai philosophique* (which is quite eighteenth century, however) in 1814; Poisson's famous *Recherches* in 1837; Cournot's *Exposition de la théorie des chances et des probabilités* in 1843; P. L. de Tchebycheff's paper ('Des Valeurs moyennes' in Liouville's *Journal de mathématique, pure et appliquée*), 1867; Venn's *Logic of Chance* (often invoked by Edgeworth) in 1866. Fechner's *Kollektivmasslehre* (1897) belongs in this period though not chronologically. The same applies to J. von Kries's *Principien der Wahrscheinlichkeitsrechnung* (1886). The Cournot of probability is the great economic theorist (see below, Part IV, ch. 7, sec. 2). My high opinion of his theory of random events is a layman's opinion. But it was shared by the late Professor Czuber of Vienna.

[6] *Elements of Logic*, which appeared originally as an article in the *Encyclopaedia*

Figure 4.4: J. A. Schumpeter *History of Economic Analysis*

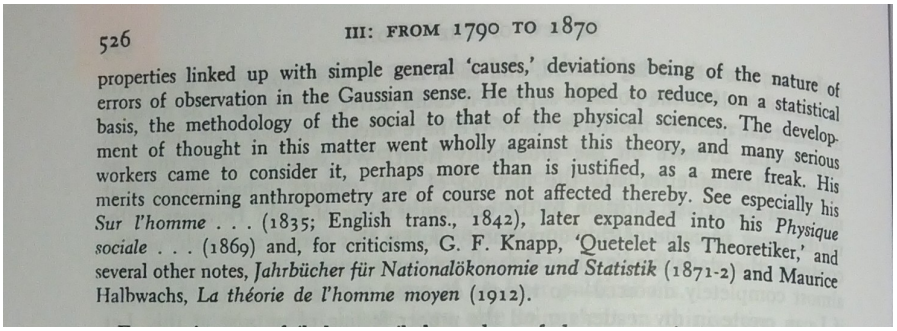


cial statistics. This is our only opportunity

Adolph Quetelet's (1796-1874) importance for our subject is small—I know of no economist of that period whose *economics* shows any traces of his influence. He was a mathematician and astronomer, and entered the field of social statistics by the door of probability. Here, so far as I can see, his merit is confined to meritorious propaganda: there is nothing original in his *Lettres à S. A. R. le duc régnant de Saxe-Coburg-Gotha sur la théorie des probabilités, appliquée aux sciences morales et politiques* (1846). But he joined the brilliant band of statistical administrators who during that period led and inspired the new statistical bureaus and, with indefatigable energy, did much to improve methods and projects and especially to promote international cooperation.

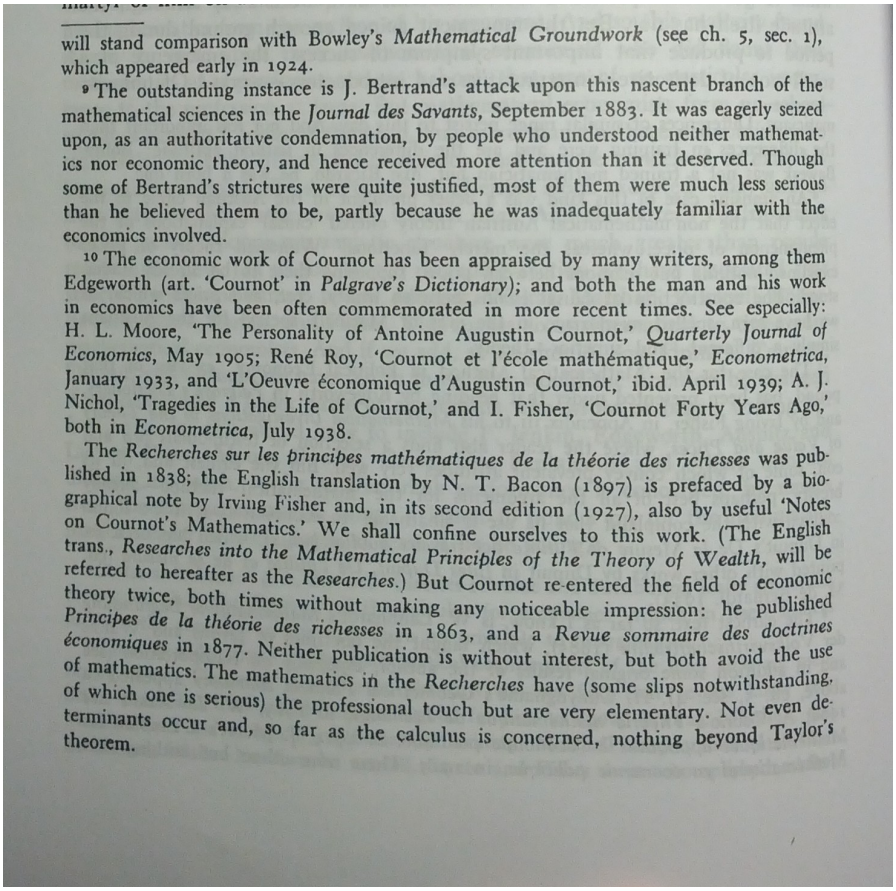
He was much more than that implies, however. His vigorous and original investigations into the distribution of human characteristics mark a step in advance that had never to be retraced and, as an example to follow, had eventually also some importance for economics. But he took another step that, after a brief success, had to be retraced: he plunged into a philosophy of a sort of statistical determinism by conceiving the theory that those investigations were revealing a stable type of average man whose

Figure 4.5: J. A. Schumpeter *History of Economic Analysis*



properties linked up with simple general 'causes,' deviations being of the nature of errors of observation in the Gaussian sense. He thus hoped to reduce, on a statistical basis, the methodology of the social to that of the physical sciences. The development of thought in this matter went wholly against this theory, and many serious workers came to consider it, perhaps more than is justified, as a mere freak. His merits concerning anthropometry are of course not affected thereby. See especially his *Sur l'homme* . . . (1835; English trans., 1842), later expanded into his *Physique sociale* . . . (1869) and, for criticisms, G. F. Knapp, 'Quetelet als Theoretiker,' and several other notes, *Jahrbücher für Nationalökonomie und Statistik* (1871-2) and Maurice Halbwachs, *La théorie de l'homme moyen* (1912).

Figure 4.6: J. A. Schumpeter *History of Economic Analysis*



will stand comparison with Bowley's *Mathematical Groundwork* (see ch. 5, sec. 1), which appeared early in 1924.

[9] The outstanding instance is J. Bertrand's attack upon this nascent branch of the mathematical sciences in the *Journal des Savants*, September 1883. It was eagerly seized upon, as an authoritative condemnation, by people who understood neither mathematics nor economic theory, and hence received more attention than it deserved. Though some of Bertrand's strictures were quite justified, most of them were much less serious than he believed them to be, partly because he was inadequately familiar with the economics involved.

[10] The economic work of Cournot has been appraised by many writers, among them Edgeworth (art. 'Cournot' in *Palgrave's Dictionary*); and both the man and his work in economics have been often commemorated in more recent times. See especially: H. L. Moore, 'The Personality of Antoine Augustin Cournot,' *Quarterly Journal of Economics*, May 1905; René Roy, 'Cournot et l'école mathématique,' *Econometrica*, January 1933, and 'L'Oeuvre économique d'Augustin Cournot,' ibid. April 1939; A. J. Nichol, 'Tragedies in the Life of Cournot,' and I. Fisher, 'Cournot Forty Years Ago,' both in *Econometrica*, July 1938.

The *Recherches sur les principes mathématiques de la théorie des richesses* was published in 1838; the English translation by N. T. Bacon (1897) is prefaced by a biographical note by Irving Fisher and, in its second edition (1927), also by useful 'Notes on Cournot's Mathematics.' We shall confine ourselves to this work. (The English trans., *Researches into the Mathematical Principles of the Theory of Wealth*, will be referred to hereafter as the *Researches*.) But Cournot re-entered the field of economic theory twice, both times without making any noticeable impression: he published *Principes de la théorie des richesses* in 1863, and a *Revue sommaire des doctrines économiques* in 1877. Neither publication is without interest, but both avoid the use of mathematics. The mathematics in the *Recherches* have (some slips notwithstanding, of which one is serious) the professional touch but are very elementary. Not even determinants occur and, so far as the calculus is concerned, nothing beyond Taylor's theorem.

Figure 4.7: J. A. Schumpeter *History of Economic Analysis*