William Stanley Jevons

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Source: *Econometrica*, Jul., 1934, Vol. 2, No. 3 (Jul., 1934), pp. 225-237

Published by: The Econometric Society

Stable URL: https://www.jstor.org/stable/1905621

WILLIAM STANLEY JEVONS

I

HIS LIFE

By H. Winefrid Jevons

Practical experience in the making of a currency is not a common part of the training of an economist, yet it may perhaps be a valuable one. William Stanley Jevons at the age of 18 was appointed one of the two assayers at the newly opened Sydney Mint. The work was offered him through the chemistry lecturer at University College, London, where he was a student, and he took the post with reluctance, owing partly to his desire to continue studying, and partly to the great distance from home; the voyage out took three months in a sailing ship. His father, Thomas Jevons, was an intellectual and able man who was interested in many engineering schemes, and in 1815 probably invented the first iron boat to sail on water. He was occupied in the family business of iron merchants in Liverpool, a development from an early nail-making business in Staffordshire, and owing to financial reverses it became necessary for Stanley to obtain some paid work. He accepted the Sydney post at his father's wish and not his own, yet the years spent in Australia were undoubtedly helpful in giving him time to shape his own plans and to realize where his great interest and talent lay. At least it was better than his own first idea of work in a Liverpool broker's office with two or three hours of study each night.

So far, Jevons' interests had lain in the natural sciences. Watching the newly made sovereigns pass into circulation must have drawn his attention to currency questions, while visits to the gold fields and studies from the industrial and social standpoint of the rapidly growing Australian towns were excellent experiences for one whose thoughts in later life were absorbed by economic problems. The practical work of assaying, too, was a training in accuracy. It may well be that when Jevons wrote his first well-known pamphlet in 1863, *A Serious Fall in the Value of Gold ascertained and its Social Effects set forth*, his thoughts turned to the assayers' room at the Sydney Mint and to the diggers at Ovens and the other big gold fields whom he had so well described in letters home, together with the crowds of dealers, storekeepers, and traders of all descriptions, who had flocked there to exchange produce for the diggers' gold.

That metal made no appeal to Jevons for its own sake. The position at the Mint was a well-paid one, and after four years there he determined to return to England, obtain some further study for a year by

utilizing his savings, and then chance what might follow after, with a possibility of returning to Australia if England offered no suitable means of livelihood. First, however, he saw more of the world by travelling home through South and North America and the West Indies, all voyages being again by sailing ship. Travel was always a delight to him.

During Jevons' time in Australia his father had died; his mother, a daughter of the well-known Liverpool citizen, William Roscoe, had died when he was only ten years old. He returned, therefore, to share lodgings in London with his sisters and brother, for whom he was to some extent responsible, and from there entered University College once more, at the age of twenty-four, taking his B.A. degree in eleven subjects at the end of a year, and so attaining what had been the height of his ambition when in Sydney. He adhered to his decision, made in Australia, to apply himself to a study of "the foundations and nature of the knowledge of man" to which he felt he had a mission, giving considerable attention to political economy during his B.A. work. In June 1860 he wrote to his brother in New Zealand: "I have fortunately struck out what I have no doubt is the true Theory of Economy . . . while the theory is entirely mathematical in principle, I show at the same time how the data of calculation are so complicated as to be for the present hopeless. . . . Most of the conclusions are, of course, the old ones stated in a consistent form, but my definition of capital and law of the interest of capital are, as far as I have seen, quite new." It is amusing to find that he had expected to be first in the class examination owing to having given so much thought to the subject and read widely on it, but met with "a sad reverse" being placed third or fourth, a fact which he attributed—probably rightly—to a difference of opinion between himself and the examiner. He consoled himself with the thought of a pleasant revenge when he published his "Theory of Economy" and re-established the science on a sensible basis.

The award of the Ricardo Scholarship was a consolation, and this, with some desultory writing, chiefly on scientific subjects, enabled him to spend two more years at the College, taking his M.A. degree in Mental Philosophy and Mathematics in June 1862, and winning the gold medal awarded to the best student in that class. Mental philosophy in those days included the subjects of Logic, Political Economy, and Philosophy, including works of the Greek Philosophers. In Mathematics, as in his B.A. work, he had the great advantage of attending classes taken by De Morgan, "an unfathomable fund of mathematics" as he described him. During his first year's work for his M.A., Jevons conceived the idea of publishing "a statistical atlas" which should give in about thirty plates of curves and diagrams all the available statistics of trade, finance, wages, pauperism, and other matters, showing the

state of the country and its people from as far back as figures were available. Much time was spent at the British Museum compiling data, only to find that no publisher would sponsor the idea, and the project ended in his publishing at his own expense in 1862 just two diagrams, the first showing the weekly accounts of the Bank of England, and the other the price of the English funds and of wheat, the number of bankruptcies, and the rate of discount.[1] These received some favorable mention.

In September 1862, he sent two papers to be read at the meeting of the British Association, the first entitled *Notice of the General Theory of Political Economy* and the other *On the Study of Periodic Commercial Fluctuations, with five diagrams.* He made a note that the Secretary of Section F informed him that the second was approved of.

Following his M.A. degree, Jevons tried a year in London, earning precariously by writing and by acting as searcher in the British Museum. His services there were not much requisitioned, and writing did not prove a paying profession. This is not to be wondered at, perhaps, as he was giving his time to the pamphlet on gold already mentioned, which was published that spring; and in December 1863 he published a work on *Pure Logic or the Logic of Quality apart from Quantity, with Remarks on Boole's System and on the Relation of Logic and Mathematics.* By that time, however, Jevons had had to relinquish his idea of living by writing, and had accepted a post as tutor at Owens College (now the University of Manchester) at the instance of his cousin, Henry Roscoe, the chemist, who was already installed there as one of the six professors. The post was a poorly paid and arduous one, for the tutor was expected to coach students in any subjects they required, and to hold classes in mathematics, Greek, and Latin. An intense shyness and dislike of public speaking made the work still more of a strain for one who was happier by far at that stage in working at his own theories in solitude. He held this tutorship for two years, however, but could not refrain from pursuing his own work at the same time. The long vacation of 1864 was entirely devoted to the problem of the exhaustion of England's coal reserves, *The Coal Question* being published in April 1865 and first making him "a known man." Already he had been elected a fellow of the Statistical Society and had spoken at the meetings of the Manchester Statistical Society. In 1864 he noted in his journal how his wildest dreams in Sydney had been exceeded, what respect he then felt for the name "statistician," and how reviews of authority had now called him "a competent statistician."

[1] These diagrams were reproduced in the first edition of *Investigations in Currency and Finance.*

The Coal Question, on account of its practical importance and the breadth of vision displayed by its author, made a more direct appeal than the works on the value of gold and on logic. Mr. Gladstone, then Chancellor of the Exchequer, was much interested, and used the probable diminution of our most advantageous coal supplies as an argument for a large reduction in the national debt, and Jevons found himself quoted more than once in parliamentary debates. As a result of this book the Royal Commission on the Coal Supplies was appointed.

It was, I think, before this book was known that the college of his native town, Liverpool, gave him the honor of his first professorship in Logic and Political Economy. The work was not much, it involved one night a week away from Manchester, but it was in his particular line. The same year he was able to give up the tutorship at Owens College, and was appointed lecturer in political economy and substitute lecturer in logic. This was followed next year by election to the newly created professorship of logic and mental and moral philosophy, and the Cobden Professorship of Political Economy at Owens College. That, even then, my father had no realization of the position he had won, is shown by the extreme anxiety with which he awaited the decision about this appointment. The relief of obtaining a comparatively well-paid post, allowing some leisure for his own work, was great.

During all these years, my father's thoughts seem to have turned naturally from economic questions to logic and then back again. After *The Coal Question* was out, the invention of a logical machine absorbed much of his time, and finally a second and greatly improved machine was shown to a meeting of the Royal Society in 1870 and a paper read thereon. This machine is preserved in the Science Museum at South Kensington, London.

In 1869, Jevons published *The Substitution of Similars, the True Principle of Reasoning, Derived from a Modification of Aristotle's Dictum*, and the following year his most widely known book on *Logic, the Elementary Lessons*.

Taxation and Currency problems were not neglected, since the list of his writings shows papers and letters written on these questions of the moment, and in 1870 he acted as president of Section F (Economic Science and Statistics) of the British Association meeting at Liverpool, his address being on rather varied social questions such as the connection of poverty and indiscriminate charity, the need for self-reliance amongst the poor, the incidence of taxation, and the excessive mortality in some of our big towns.

Jevons, as already mentioned, first conceived his new views on the theory of Political Economy while still a student; and when he sent a paper on it to the British Association Meeting in 1862, a very brief

abstract was inserted in the Annual Report. The original paper appeared in the *Journal of the Statistical Society* for 1866; but it was not till the books on logic were completed that he set to in earnest to elaborate in book form his theory of utility and the mathematical approach to economics. He spent some eight or ten months over writing *The Theory of Political Economy*, which was published in 1871.

M. Léon Walras of Lausanne, unaware of the earlier publication of this theory, had arrived at much the same views independently, and in 1874 some correspondence between them occurred as to who was first in the field; M. Walras, on seeing the *Statistical Journal* for 1866 generously acknowledged my father's priority and published the correspondence in the *Journal des Économistes* under the title "Théorie Mathématique de l'Échange, Question de Priorité," though as my father wrote, "As to the question of priority of publications, it is of course, of less importance than that of the truth of the theory itself." In England, the mathematical theory of economics had, up to that time, been either neglected or criticized adversely, many economists not having sufficient mathematical grounding to follow all the arguments in the book; and Jevons regarded Walras's independent writings as satisfactory proof of the validity of his own application of mathematical principles, though they followed a different course of reasoning. Interest in the mathematical approach to political economy was indeed more advanced then on the Continent than in England, and my father corresponded about this time with various economists abroad on points connected with the *Theory of Political Economy*, and had the pleasure of seeing it translated into Italian in 1876.

In 1871, however, his thoughts had turned to logic again, and the two volume book *The Principles of Science*, his biggest work on logic, appeared that year. Here he criticized some of J. S. Mill's views, as he had done in political economy, and incurred again much opposition from the ardent followers of the latter.

Money and the Mechanism of Exchange appeared in 1875, and was translated into French, German, and Italian. It is descriptive of the monetary and banking methods of the world, and the laws of circulation, and was written clearly and simply for the untrained reader. In the same year Jevons raised the question of the possible dependence of harvests on the state of the sun as evidenced by sunspots, reading a paper at the British Association Meeting on "The Solar Period and the Price of Corn." This was his first mention of the question of sunspots and trade; but, as he then pointed out, he did not assert the truth of the connection and the paper was afterwards withdrawn for further consideration. Three years later the subject was followed up by a paper on "The Periodicity of Commercial Crises and its Physical Explanation,"

at the meeting of the British Association and by articles in *Nature*. Two more works on logic were completed, viz., a little primer, and *Studies in Deductive Logic;* and in 1882 a small book *The State in Relation to Labour* for the English Citizen Series.

The early work at Owens College had been laborious, and in addition Jevons had worked extremely hard at his own writing. The inquiry for *The Coal Question*, for instance, was only fully commenced in January 1864, and the writing was finished before Christmas, sometimes five or six hours at a stretch without a break being given to it in vacations and much being done late into the night. When not otherwise occupied, his mind was always dwelling on some economic or logic problem. The professorship too, involved some fatiguing evening work. Small wonder, then, that his health soon began to give trouble, sleeplessness and nervous and physical exhaustion inevitably following, so that when only thirty-six years old he was obliged to give up all work for a time; in 1873 he had a year's leave from the College, part of which was devoted to writing and part to tours abroad. Visits to Norway, of which he made many, were always a delight to him. Some quiet fishing and travelling in out-of-the-way parts by cariole, local steamer, or rowing-boat, gave complete mental change. It was, indeed, only by holidays taken on the move—sightseeing, driving, or, when fit enough, walking, that he was able to obtain mental rest. From this time his work at the College was lightened by the appointment of a lecturer for the evening work; but in 1875 he sent in his resignation. His reasons for taking this step were to secure leisure for writing, and the opportunity of residence in London, which would enable him to attend the Political Economy Club, where he wished for more opportunity to express his views as against the followers of J. S. Mill, and he wished also to be present at the meetings of other learned societies. The professorship in Political Economy at University College fell vacant after this decision was made. As it involved but little lecturing work, Jevons was induced to accept it, and moved to London in 1876, finding a house near Hampstead Heath which gave him the essential quiet. He resigned this chair in 1880 and also his post as one of the secretaries of the Statistical Society, as his health still gave him much trouble, and he wished to devote his time to a large work to be called the *Principles of Economics* which should deal in full with the whole science according to his methods of approach. This book was never finished. A fragment consisting of several chapters and parts of others was published as late as 1905 under the title *The Principles of Economics, a Fragment of a Treatise on the Industrial Mechanism of Society and other papers*, with a preface by Henry Higgs. Another posthumous volume of papers under

the title *Investigations in Currency and Finance* had been previously edited by Professor Foxwell.

Jevons was drowned while bathing on the south coast of England in August 1882, the shock of the cold water proving too much for his enfeebled health. He was a few weeks short of forty-seven years of age. He left a wife who had been a constant companion and help in his work, and three small children, too young to understand its nature. The widespread expressions of regret proved the esteem in which he was held by people in diverse circles and the world wide reputation he had established as a writer on logic and economics. Former pupils have shown by their remarks, however, that his college work was never neglected for his writing, and that he was held in high estimation, not only for the instruction he gave, but for his high-minded and lovable personality.[2]

II

HIS SCIENTIFIC CONTRIBUTIONS

By H. Stanley Jevons

Jevons' early publications were almost entirely on natural science. In Australia meteorology was his hobby, and for two or three years he made daily observations of pressure, temperature, wind, and rainfall, which were published in the local press, and wrote papers on such subjects as "The Deficiency of Rain in an Elevated Rain-Gauge." His growing interest in social problems and determination to be acquainted with the facts is well illustrated by a social survey of Sydney which he made during his last two years of residence there.[3] His interest in natural sciences never waned. Geology and botany provided outdoor interests; and not long after *The Coal Question* was published he purchased a good microscope, and used it, amongst other things, for an investigation of the molecular motion in liquids which he named "pedesis," but which is now generally known as Brownian Motion.

It was Jevons' training in natural science which determined his method in logic and in economics, and perhaps made him a follower of Bentham. He was excited by Mill's inconsistences, fallacies, and want of system, both in the latter's *Logic* and in his *Political Economy*, particularly by his one-sided and inaccurate presentation of the theory of value; and he felt that it was his special mission to destroy the al-

[2] I am indebted for many details in this article to the *Letters and Journal of William Stanley Jevons*, edited by his Wife, published by Messrs Macmillan & Co. in 1888.

[3] Published in the Sydney *Morning Herald*, 1929.

most universal acceptance in England of Mill's logic and political economy. His interests were wide, however, as may be realized when it is found that his writings, besides those on natural science already referred to, fall into six classes: (1) on logic and the theory of probability, (2) on prices and periodic commercial fluctuations, (3) on the pure theory of economics, (4) on money and banking, (5) factual studies, such as the social survey already mentioned and the *Coal Question*, (6) studies on social reform and labor questions.

Jevons' writings on logic are noteworthy for their clarity and conciseness, and their wealth of illustrations He was much influenced by Boole's mathematical logic, but he found much in it to criticize, and stripped it of its mathematical dress, and simplified Boole's methods. He also acknowledged indebtedness to De Morgan and Archbishop Thomson.[4] Jevons reduced logical inference to a simple but complete system, and defined the inductive or scientific method, showing its unity in all sciences, and the fundamental importance of the theory of probability.

His publications on prices and commercial fluctuations begin (except for the two diagrams mentioned in the previous section) with the *Serious Fall in the Value of Gold*, which is notable for his compilation of index numbers of prices using the geometric mean, and for setting forth how different sections of the population are affected by a rise or a fall of the price level. Now that index numbers and changes of price level are commonplaces which everybody understands, it is difficult to realize the originality of the research embodied in this pamphlet. This was followed a few years later by a statistical study of the returns of the Bank of England, which showed clearly an annual and quarterly periodicity, the former due mainly to finance of the harvest and to holiday expenditure, the latter to the customary quarterly disbursement of dividends. For demonstrating that the price level had risen after the discoveries of gold in California and Australia, it was only necessary to investigate prices from 1845 to 1862; but he subsequently extended his series of index numbers of prices back to 1782, and made a further study of commercial crises. He was struck by the frequent recurrence of an interval of approximately ten years between crises and, following a suggestion made by the astronomer, Sir William Herschel, in 1801, he sought to connect the rough periodicity of crises with the period of solar change as exhibited by the recurrence of maxima of sunspots. He did not suggest, as has been commonly asserted, that sunspots were the cause of crises, or of trade fluctuations, but pointed out that there was a close correspondence between the

[4] *Studies in Deductive Logic*, Preface, p. xii.

average period of recurrence of sunspot maxima and the average interval between crises. It was reasonable to suppose that the increase and decrease of the sun's spotted area indicated changes of the sun's condition which might affect solar radiation. This would cause variation of the weather in a corresponding cycle of years, which would affect harvests, and these in their turn the demand for industrial products, and so the activity of trade and industry.

Jevons' writings on the theory of economics are: the paper already mentioned which was read before the British Association, the *Theory of Political Economy;* and the posthumous *Principles of Economics.* The primer of political economy, written with unusual clearness and simplicity, is very elementary, contains no mathematical treatment, and to a large extent follows the conventional teaching of the time. Neither in his college teaching nor in his textbooks did Jevons attempt to force on students his (then) peculiar views.

The *Theory of Political Economy* has two distinctive features: the psychological basis and the mathematical method, which are not necessarily associated. The former he derived mainly from Bentham, and developed his calculus of pleasure and pain. These he regarded as opposite states of feeling caused by sensations of every kind and capable of neutralizing one another. Anything which affords pleasure or wards off pain at the time of consumption or use has actual utility. A pleasant or painful state of feeling is also produced by *anticipation* of the use or consumption of anything, whether in fact consumption of the particular thing or activity would or would not have the anticipated results. Anything to which a person attributes the power of increasing his pleasure or warding off pain when its consumption is anticipated, has for him *prospective* utility. It is in order to gain prospective utility that production and exchange are carried on. The rate of gain of prospective utility in time may be balanced against the present disutility, or painfulness, of the effort of work, as in the theory of labor (Chapter V) in which the psychological reaction leading to the cessation of labor is analyzed.

His mathematical method consisted, as is well known, in applying the methods of the differential calculus, or at least its ideas and symbols, to elucidate man's activities in satisfying his wants. In the theory of exchange, quantity of commodity is taken as the independent variable, in the theories of production and distribution quantities of labor and capital alternatively. Perhaps the most important contribution which Jevons made to economic thought in the seventies of the last century was the clear distinction he made between total utility and its first derivative, which he called final degree of utility.

It is perhaps unfortunate that he set himself the task of stating his

theory in mathematical garb and in popular terms in the same book. The whole of his theory, and more than he ever found time to write out, could have been expressed in mathematical symbols in a few pages. A more popular exposition would have followed naturally, but separately. As it is, mathematicians have always been irritated by repetitions and superfluous explanations, and non-mathematical readers have been puzzled or frightened off on first perusal by the alarming display of mathematical symbols. Apparently this mistake was due to his sense of the urgency of converting contemporary economists, the great majority of whom were non-mathematical, to acceptance of his quantitative method and its clear definitions.

In the application of mathematics to economics, Jevons was, of course, anticipated by Cournot, though at the time he was unaware of this; but the latter had no conception of marginal utility or of the equation of exchange, having confined himself to market demand and supply, monopolies, rent, etc. It remained for Walras on the Continent to develop independently the mathematical conceptions of utility, without the hedonic basis. The calculus of pleasure and pain, and the development of the idea of marginal utility from that, had been anticipated by only one man, Gossen. The latter developed the foundations of the theory elaborately, but used almost exclusively straight line functions, and failed to discover anything which could rank as a contribution to the theory of distribution.

Jevons has been criticized by Marshall and others for over-emphasizing demand as the determinant of value. It may be admitted that the book contains more matter relating to demand than to supply as determining price. This was clearly due to the author's desire to correct the prevailing doctrines which practically ignored demand and its changes, except in special cases. Careful reading shows that he was fully aware of the effects of differences or changes in the supply of the factors of production in the causation of price.

Questions of greater interest are how far Jevons understood the theory of distribution as subsequently generalized by Marshall, and how far his book contributed to Marshall's mathematical development of the theory. That Jevons had a good appreciation of the general theory of marginal equilibrium is clear from several passages, some of which it may be of interest to quote. In the "Theory of Labour,"[5] for instance, we find the following: "Thus we have proved that commodities will exchange in any market in the ratio of the quantities produced by the same quantity of labour. But as the increment of labour considered is always the final one, our equation also expresses the truth,

[5] Second edition, pp. 203–204; fourth edition, p. 187.

that *articles will exchange in quantities inversely as the costs of production of the most costly portions, i.e., the last portions added.* This result will prove of great importance in the theory of Rent.

"Let it be observed that, in uniting the theories of exchange and production, a complicated double adjustment takes place in the quantities of commodity involved. Each party adjusts not only its consumption of articles in accordance with their ratio of exchange, but it also adjusts its production of them."

Again a little further on[6] we read: "The quantities of commodity given or received in exchange, are directly proportional to the degrees of productiveness of labour applied to their production, and inversely proportional to the values and prices of those commodities and to their costs of production per unit, as well as to their final degrees of utility." The expression "degree of productiveness of labour" is clearly the same idea as marginal net product or marginal productivity of labour, because the first passage states that the increment of labour considered is always the final, that is, marginal, one.

In the "Theory of Rent" we read of equality of the "productiveness of labour, as regards the last increment of labour applied" when applied to different pieces of land; and "we may say, then, that whenever a labourer or body of labourers distribute their labour over pieces of land with perfect economy, the final ratios of produce to labour will be equal."[7]

In the succeeding paragraph and subsequently, however, the same quantity is termed "final rate of production." There is an important paragraph in the chapter "Theory of Capital," at the end of the section on the Tendency of Profits to a Minimum, in which the author makes very clear the relations between wages, rent, and interest, and the difference between the "whole yield" and "the final rate of yield." There is no suggestion that I can find, however, of that general view of distribution which regards the rate of rent of land as the marginal productivity of land varied in respect of a combination of the other factors of production (and so on, as regards each of the factors of production considered as variable in relation to the others, thus unifying the theory of the demand for the factors of production); though in the latter part of the preface to the second edition he remarks on the parallelism of the theories of rent, wages, and interest.

Of the numerous additions made in the second edition, perhaps the most important after the long new preface are the sections on the dimensions of economic quantities. The late Professor Allyn A. Young wrote

[6] Second ed., p. 209; 4th edition, p. 192.

[7] Second edition, p. 235, fourth edition, pp. 216–217.

in regard to this innovation:[8] "Here Jevons illustrates to perfection his extraordinary power of raising new questions of the utmost significance without satisfactorily solving them. In some respects his treatment is perfunctory and superfluous, but suggestive and tantalizingly incomplete, and not altogether accurate." I cannot agree that the treatment is either perfunctory or superfluous. The theory of dimensions is indispensable for clear thinking in the theory of economics, and it would be an advantage if more attention were paid to it now.

The *Principles of Economics* was intended to be a general treatise on economics suitable for the non-mathematical reader. It is written in a clear, easy style with a wealth of examples, many of great interest. Judging from the few chapters which were written, however, it does not seem likely that the book would have made any considerable contribution to the further development of economic theory. The variety of Jevons' activities when resident in London, and the poor health of his last few years, seem to have prevented that continuous mental concentration by which alone the pure theory of economics could be fully developed.

It is difficult to estimate the extent of the contribution which Jevons made to the development of modern economic theory. He was certainly the first to win acceptance for and popularize the theory of marginal equilibrium. There is evidence that Marshall gained ideas from the paper read before the British Association, published in 1866, and from the *Theory of Political Economy*, which found their place in his *Principles of Economics* (first published in 1890). On the other hand, Marshall, his interest in economics once aroused, would almost certainly himself have developed sooner or later the equation of exchange and the theory of distribution as they appear in his *Principles*, even if he had remained ignorant of the writings of Jevons, Gossen, Walras, and others.

Perhaps Jevons' major contributions to economic theory were his exposure of the fallacies of the Ricardo-Mill School, his establishment of the theory of utility as the basis of demand, the theory of exchange and its implications, and the true theory of wages. He did much to popularize the study of pure theory and to gain recognition of its mathematical basis. He accomplished the objects which he had closely at heart, and was perfectly conscious of the fact that he was leaving the greater part of the field of economic theory for others to work out. In the preface to the second edition of the *Theory* he wrote: "I must beg the reader to bear in mind that this book was never put forward as containing a systematic view of economics. It treats only of the

[8] *American Economic Review*, II (1912), 576.

theory, and is but an elementary sketch of elementary principles. The working out of a complete system based on these lines must be a matter of time and labour, and I know not when, if ever, I shall be able to attempt it." The fact is that economic theory was but one of his interests, and this has to be remembered if his few writings on the subject are contrasted with the output of professors of economics of later times. Probably he gave only a very small portion of his working time to the pure theory of economics. Several projects, such as the preparation of an annotated edition of the *Wealth of Nations*, were commenced, but never finished. Studies in logic, in statistics, banking, currency, and social reform, seem to have had the first claim on his time.

London, England