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while to enable men to plant with the full security of the ownership of land, State loans to assist tenants in purchasing small holdings are also recommended. In the latter case, the State would be helping to set men up in business to compete with those who are struggling to make fruit farms pay by means of their own capital, which would be a great injustice, and not within the legitimate functions of the State.

Taxation abuses, and particularly the custom of raising a farmer's assessment for rates on land planted with fruit before there has been time for it to become profitable, are well treated. There are also some good suggestions concerning railway transport and rates. Other recommendations relate to the inspection of imported nursery stock and fruit, the modification of rural bye-laws to allow of the construction of cheap cottages, the increase and extension of markets, the establishment of co-operative societies for the sale of fruit and other purposes, and some details relating to the employment of boys in the fruit-picking season, wild birds destructive of fruit, and some such trivial matters as the labelling of jam made from imported fruit, and the publication of statistics of fruit condemned as unfit for food.

On the whole, there is so much that is excellent in the report that the omission of reference to the most important of all the subjects affecting the interests of fruit-growers is all the more to be regretted.

WILLIAM E. BEAR

JEVONS'S ECONOMIC WORK.¹

THE long awaited publication of Jevons's posthumous and fragmentary treatise on the principles of Economics naturally suggests considerations on the general character and effect of his economic work. His application of Mathematics to Economics was no accident, but stood in close relation to the general cast of his mind and scheme of his constructive thought. It was the same impulse that impelled him to contrive his logic machine, to attempt to ground the principles of science on the doctrine of chances, to look for the source of commercial crises in the supposed cycle of meteorological phenomena of which the spots on the sun were an indication, and to apply the principles of the differential calculus to the theory of value. In all these instances

¹ *The Principles of Economics*. By W. S. Jevons. Edited with a preface by Henry Higgs. (London: Macmillan and Co. 1905. Pp. xxxviii, 273.)

Jevons laid himself open to a superficial charge of materialism (in Comte's sense of attempting to treat the higher sciences by the methods of the lower), and in none of them was the charge justified. What Jevons did was not to degrade the higher sciences to mere applications of the lower, but to erect a hierarchy of science, not in name, but in fact, by actually building the higher on the assured basis of the lower, and ascertaining what elements in it could be, so to speak, precipitated, and rendered amenable to the exacter treatment which they evaded when held in rhetorical or metaphysical solution. For example, Aristotle's rules for the syllogism are just as mechanical as Jevons's machine, and the mediæval *barbara celarent* are as much a logical abacus as Jevons's keyboard and pulleys are. But Jevons fully and clearly recognised the mechanical nature of the process, and consequently perfected its mechanism. By an odd linguistic error he called his logic machine a "logical" machine, as though the machine itself were logical and could reason; but, as a matter of fact, he showed with the most perfect cogency that whereas the formulation of the premisses is the all important process, and is in no sense mechanical, yet when once they are formulated they can be manipulated mechanically, and all their implications rendered explicit without chance of error or omission, if the mechanism is rendered perfect. If it is not, the process will be no less mechanical but will be more liable to error. It will be worked by bad mechanics, but still by mechanics.

In precisely the same way, when Jevons recognised the quantitative nature of certain fundamental conceptions of Economics, and specifically that exchange value is, in the limit, the first differential co-efficient of value in use, he was rescuing from rhetorical and metaphysical treatment that portion of the subject which is *de facto* mathematical, and which must be treated either by explicit and accurate, or by loose and disguised mathematical methods. He was not, according to the vulgar reproach, attempting to treat the infinite complexity of human wants and impulses as if they could be dealt with by the *à priori* and deductive methods of pure mathematics. On the contrary, no man was more profoundly convinced of the necessity of wide and patient inductive researches in economic science, and no man brought subtler psychological analysis to bear upon its problems than did he; only he recognised that, when a certain class of abstract economic propositions are once made, being essentially mathematical in their character, they rigidly involve or exclude certain other propositions; and if their mathematical character is recognised, then

we can make sure that we have lost nothing and inserted nothing on the road when we pass from the premisses to the conclusions. Here, as in the mechanism of Logic, you eliminate a source of error by the introduction of mathematical methods, but you can get nothing out at the end that you did not implicitly insert at the beginning, and what you insert can seldom be got by mathematics. It may indeed be true (and probably is) that Jevons hoped by the aid of statistics to obtain a larger number of exact formulæ than are ever likely to be actually secured, and that he, therefore, over-estimated the extent to which mathematics can penetrate the body of Economic Science. But if so, this was a mistaken estimate, not a mistake of principle. He was right in declaring that certain fundamental relations and conceptions in the theory of political economy are essentially mathematical, and that the only question is whether they are to be treated by sound or by unsound mathematics.

Now Jevons himself was convinced that the recognition of this fact involved a revolution. In June, 1860, he wrote to his brother: "I have fortunately struck out what I have no doubt is the *true Theory of Economy*, so thoroughgoing and consistent, that I cannot now read other books on the subject without indignation." He became more and more convinced as years went on that his discovery was destined to reconstruct the study "on a sensible basis," and that, after the work of Ricardo and Mill, economists were called upon "to pick up the fragments of a shattered science and to start anew."

To readers of the ECONOMIC JOURNAL it is unnecessary to explain in detail what Jevons's "discovery" was. It was, of course, what he himself described as the principle of "final utility," and what may now be more broadly stated as the principle of variations in marginal significance. He was convinced, as we have seen, that this would revolutionise at any rate the abstract portion of economic theory; and now, a full generation after the publication in 1871 of the *Theory of Political Economy*, we have to ask whether the revolution has taken, or is taking place. It is clear to the careful reader of Jevons that the universal application of the theory of margins was rather felt by him as a presentiment than carried out and realised in its details. But the generation of economists that has followed him, especially in Austria and in America, whether directly inspired by his own work, or following out the parallel lines of other investigators, has done much towards carrying out his principles to their legitimate results. Under their analysis the conception

of cost of production is being reduced from a position co-ordinate with that of marginal utilities to a secondary manifestation of that principle itself; and the whole group of laws of distribution has been, or is being, reduced to a variety of applications of the one principle of shifting marginal efficacies. But, on the other hand, parallel to this stream of thought there has flowed and flows another, of which we are far more effectively conscious in England. The school of economists of which Professor Marshall is the illustrious head may be regarded from the point of view of the thorough-going Jevonian as a school of apologists. It accepts, indeed, and applauds the Jevonian principles, but declares that, so far from being revolutionary, they merely supplement, clarify, and elucidate the theories they profess to destroy. To scholars of this school the admission into the science of the renovated study of consumption leaves the study of production comparatively unaffected. As a determining factor of normal prices, cost of production is co-ordinate with the schedule of demands registered on the "demand curve." And, however modified, the old distinctive categories of rent, interest, and earnings, still hold their place in the forefront of the study of distribution.

Such being the position of economic thought, one naturally turns to Jevons's posthumous work to learn, in the first place, whether the author had made any essential advance in his own apprehension of the significance of his principles, and in the second place whether he makes any essentially fresh contribution to the controversy itself, at the stage to which three and twenty years of arguments and investigations have now brought it. Broadly speaking, I think that both of these questions must be answered in the negative. But on the other hand, there is hardly a paragraph in the whole of this fragment which can be thought of as superseded, refuted, or rendered superfluous by the regrettable delay which has so long withheld it from the public.

Let us at least be thankful that we possess it at last. We cannot afford to lose even a fragment of the work of Jevons, and though his special mathematical method is not here pursued, yet the characteristics of his mind are everywhere manifest. His keenness of observation, his boldness and freedom from prejudice, his interest in out of the way economic facts (such as the oscillation of cinders between small positive and small negative values, and his ingenious and humorous parallel between these same cinders in Manchester and wives in the Babylonian market), his wide and curious reading, and, lastly, his belief that all evil economic influences were incarnate in John Stuart Mill, all com-

bine to make the man live again in these pages; and the very fact that the work is fragmentary, if it robs it of the weight of a finished and systematic utterance, gives it something the charm of conversation.

The volume also contains reprints of the remarkable essay on Richard Cantillon, of an essay on the future of Political Economy, and of a highly interesting and stimulating pamphlet on Lowe's proposed and abandoned match tax, from which last may be culled the following characteristic psychological observation: "Many of the stamp duties, though really exceedingly troublesome, are patiently borne, because they become associated with agreeable incidents, such as the receipt of money, the completion of important business, the conferring of authority, &c."

It can hardly be said that the explanations or apologies in the preface succeed in justifying the long delay in the issue of this volume; but it would be ungracious not to add that everything which affectionate reverence can do to present this final volume in a satisfactory form has been done by the patience, industry and acumen of the editor. We are thankful to have on our shelves at last the "complete works" of one of the most powerful, bold, and original thinkers that have devoted themselves to economic science.

PHILIP H. WICKSTEED

PROFESSOR DIETZEL ON DUMPING AND RETALIATION.

IN the March number of the ECONOMIC JOURNAL an article on "Free Trade and the Labour Market" appeared over the distinguished name of Professor Dietzel. The same writer has contributed to the discussion of another side of our fiscal problem a little book entitled *Vergeltungszölle* (reviewed by Professor Edgeworth in the December issue of the JOURNAL). My purpose in the following note is, not to discuss these contributions in general, but to take up a few points in which I venture to think that Professor Dietzel's arguments are unsatisfactory. The criticisms that I shall offer are made from the standpoint of cordial agreement with his broad conclusions.

I.

In the first place, I shall consider some points from the article in the ECONOMIC JOURNAL, Professor Dietzel's main