Alfred Marshall (1881) "Review of F.Y. Edgeworth's *Mathematical Psychics*", *The Academy*, June 18, 1881, p.457.

[p.265]

[Introduction by John K.Whitaker (1975): Marshall's second and last book review (his first being that of Jevons)[2] appeared in *The Academy*, 18 June, 1881 (p.457). According to J.M. Keynes, it led to an acquaintance between Marshall and Edgeworth which ripened into a lifelong friendship.[3] It seems worthwhile reproducing it here, as it has never been reprinted and remains relatively inaccessible. The argument about the application of barter curves to labour bargaining had already been made by Marshall in Part II Ch. 1 of his unpublished trade volume.[4] The argument on the preferability of a price-quantity approach to value, over a quantity-quantity or barter one, had been suggested in the 1876 essay on 'Mr Mill's Theory of Value.'[5] - **JKW]**

F.Y. Edgeworth, *Mathematical Psychics: an Essay on the Application of Mathematics to the Moral Sciences*. (Kegan Paul, London, 1881)

This book shows clear signs of genius, and is a promise of great things to come. It is called 'An Essay on the Application of Mathematics to the Moral Sciences.' But the moral sciences are various and vast; and a goodly volume might be filled with a mere enumeration of the openings which they offer for the use of mathematical language and mathematical method. The essay before us attempts no such task, but it mainly devoted to the fundamental problem of the mathematical rendering of the 'Calculus of Pleasure'; and this is regarded from two points of view, as the 'Economical Calculus' and as the 'Calculus of Utilitarian Ethics'.

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[2] **[In *The Academy*, 1 Apr 1872 (see *Memorials*, pp.93-100) - JKW]**
[3] **[See Vol. 1, p.23, above - JKW]**
[4] **[See Section III.5, above - JKW]**
[5] **[*Memorials*, pp.128-9 - JKW]**

The discussion of this problem is introduced by an argument tending to show that 'mathematical reasonings are possible without numerical *data*'.[6] It is well put, but there is a certain air of unreality about all such arguments. To a person who thinks that mathematics are a complex kind of arithmetic, a sort of highly involved double rule of three, argument is useless. While to a person who does know the meaning **[p.266]** of the terms used, it seems but a truism to say, in words which Mr. Edgeworth quotes from Cournot: --

> 'L'une des fonctions les plus importantes de l'analyse consiste précisement à assigner des relations déterminées entre des quantités dont les valeurs numériques, et même les formes algébriques, sont absolument inassignables.'[7]

The real question is not whether it is *possible*, but whether it is *profitable* to apply mathematical reasonings in the moral sciences. And this is a question which cannot be answered *a priori*; it can be answered only from the experience of those who make the attempt. When a man has cleared up his mind about a difficult economic question by mathematical reasoning he generally finds it best to throw aside his mathematics and express what he has to say in language that is understood of the people.

The general aim of Mr. Edgeworth's 'Economical Calculus' is to investigate the conditions under which the terms and extent of a contract between two people can be determined beforehand, the utility to each of them of the things with regard to which the contract is made being known. He considers this problem -- firstly, when each of the two dealers stands alone; and, secondly, when he is one of a number of competing dealers. He supposes that if X exchanges an amount x of his commodity for an amount y of the commodity which Y has to dispose of, the total gratification which X will get from what is left of his commodity after subtracting x from it, together with that which he will get from an amount y of the other commodity, may be represented by $P = F(x, y)$. This total gratification he calls, rather awkwardly, 'the utility of X.' In like manner he represents the utility of Y by $\pi = \phi(xy)$. He then seeks for 'the contract curve' -- that is, the locus of points corresponding to contracts, which, when once made, are settlements, in this sense that no change of the terms can be proposed which will be acceptable to both parties; its equation is, of course,[8] **[p.267]**

$$\frac{dP}{dx}\frac{d\pi}{dy} - \frac{dP}{dy}\frac{d\pi}{dx} = 0$$

This equation is, as Mr. Edgeworth points out, almost the same as Mr. Jevons's celebrated equation of exchange. Bt he gives it a new interpretation, and applies it to new uses; and by reasonings which, partly from the frequent use of unexplained metaphor, are rather hard to follow, he deduces as list of cases in which the terms of contract are unstable or indeterminate. He argues, for instance, in one of his numerous appendices, that contracts

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[6] [Not, apparently, a direct quotation, but see *Mathematical Psychics*, pp.v, 2, 83. **- JKW**]

[7] [*Mathematical Psychics*, p. 83 (quoted from p.51, § 21, of the 1838 edition of Cournot's *Recherches*; p. 48 of the Bacon translation.) - **JKW**]

[8] [The derivatives are clearly partial, whilst $\pi = \phi(xy)$ should be interpreted as $\pi = \phi(x, y)$. **- JKW**]

between employers and workmen, and between Irish landlords and cottier tenants, are not generally made under the conditions which enable the terms of the contract to be determined beforehand; the terms depend to a great extent upon the advantageous position with regard to bargaining, and the skill in bargaining, of the several parties concerned. This is, of course, not entirely new, but it is put in a new way.

His readers may sometimes wish that he had kept his work by him a little longer till he had worked it out a little more fully, and obtained that simplicity which comes only through long labour. But taking it as what it claims to be, 'a tentative study', we can only admire its brilliancy, force, and originality.

It will be interesting to watch the development of his theory, and, in particular, to see how far he succeeds in preventing his mathematics from running away with him, and carrying him out of sight of the actual facts of economics. For he has adopted a mode of expressing the problem of exchange which gives him at once a wide grasp and great freedom of movement, but which has the disadvantage of not being very easily translated so as to express the conditions of ordinary mercantile transactions. He takes barter as his typical bargain, and lets x and y represent, as we have seen, quantities of the two things bartered. No doubt this is the right way of treating some problems of international trade, and what is nearly the same thing, of the trade between the members of different compact industrial groups, whether the groups are formally organised or not. But there are many reasons for thinking that the greater part of economic theory can be dealt with most easily by letting x represent the amount of the commodity dealt in, **[p.268]** and y the price of the unit of that commodity expressed in the terms of money, which is supposed provisionally to have a uniform purchasing power.[9] This method certainly lends itself most easily to the task of interpreting the past and directing the future of statistical enquiries -- a consideration of the first importance. If, however, Mr Edgeworth can prevent his theories from becoming too abstract he may do great things by them.

There is little room left to discuss his Calculus of Utilitarian Ethics; but this is the less to be regretted because the greater part of the substance of it has been published by him before.[10] Suffice it that he starts from the position that different men have different capacities for happiness and different capacities for work, and applies mathematics with great originality and suggestiveness to the enquiry how work and wealth must be distributed so as to give the greatest possible happiness. Perhaps the problem which he attacks is incapable of a complete solution; but it may be safely said that no one can read his discussion of it without profit.

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[9] [This is Marshall's standard assumption. Compare p. 188, above; Vol 1. p.128; *Economics of Industry*, pp.68-9; *Principles I*, p.62. - **JKW**]

[10] [See F.Y. Edgeworth, *New and Old Methods of Ethics* (James parker and Co., Oxford and London, 1877). Also see F.Y. Edgeworth, "The Hedonical Calculus", *Mind*, Vol 4 (July 1879) pp.394-409. **- JKW**]