

Space for Notes



Stanley Jevons
The Theory of Political Economy
(1871)

Chapter III The Theory of Utility

Definition of Terms

PLEASURE and pain are undoubtedly the ultimate objects of the Calculus of Economics. To satisfy our wants to the utmost with the least effort-to procure the greatest amount of what is desirable at the expense of the least that is undesirable-in other words, *to maximise pleasure, is the problem of Economics.* But it is convenient to transfer our attention as soon as possible to the physical objects or actions which are the source to us of pleasures and pains. A very large part of the labour of any community is spent upon the production of the ordinary necessities and conveniences of life, such as food, clothing, buildings, utensils, furniture, ornaments, etc.; and the aggregate of these things, therefore, is the immediate object of our attention.

It is desirable to introduce at once, and to define, some terms which facilitate the expression of the Principles of Economics. By a *commodity* we shall understand any object, substance, action, or service, which can afford pleasure or ward off pain. The name was originally abstract, and denoted the quality of anything by which it was capable of serving man. Having acquired, by a common process of confusion, a concrete signification, it will be well to retain the word entirely for that signification, and employ the term *utility* to denote the abstract quality where an object serves purposes, and becomes entitled to rank as a commodity.

Whatever can produce pleasure or prevent pain may possess utility. J.-B. Say has correctly and briefly defined utility as “la faculté qu'ont les choses de pouvoir servir à l'homme, de quelque manière que ce soit.” The food which prevents the pangs of hunger, the clothes which fend off the cold of winter, possess incontestable utility; but we must beware of restricting the meaning of the word by any moral considerations. Anything which an individual is found to desire and to labour for must be assumed to possess for him utility. In the science of Economics we treat men not as they ought to be, but as they are. Bentham, in establishing the foundations of Moral Science in his great *Introduction to the Principles of Morals and Legislation* (page 3), thus comprehensively defines the term in question:

“By utility is meant that property in any object, whereby it tends to produce benefit, advantage, pleasure, good, or happiness (all this, in the present case, comes to the same thing), or (what comes again to the same thing) to prevent the happening of mischief, pain, evil, or unhappiness to the party whose interest is considered.”

This perfectly expresses the meaning of the word in Economics, provided that the will or inclination of the person immediately concerned is taken as the sole criterion, for the time, of what is or is not useful.

The Laws of Human Want

Economics must be founded upon a full and accurate investigation of the conditions of utility; and, to understand this element, we must necessarily examine the wants and desires of man. We, first of all, need a theory of the

consumption of wealth. J. S. Mill, indeed, has given an opinion inconsistent with this. "Political economy," he says,* "has nothing to do with the consumption of wealth, further than as the consideration of it is inseparable from that of production, or from that of distribution. We know not of any laws of the consumption of wealth, as the subject of a distinct science; they can be no other than the laws of human enjoyment."

* *Essays on some Unsettled Questions of Political Economy*, p. 132.

But it is surely obvious that Economics does rest upon the laws of human enjoyment; and that, if those laws are developed by no other science, they must be developed by economists. We labour to produce with the sole object of consuming, and the kinds and amounts of goods produced must be determined with regard to what we want to consume.

Every manufacturer knows and feels how closely he must anticipate the tastes and needs of his customers: his whole success depends upon it; and, in like manner, the theory of Economics must begin with a correct theory of consumption. Many economists have had a clear perception of this truth. Lord Lauderdale distinctly states,* that "the great and important step towards ascertaining the causes of the direction which industry takes in nations . . . seems to be the discovery of what dictates the proportion of demand for the various articles which are produced." Senior, in his admirable treatise, has also recognised this truth, and pointed out what he calls the Law of Variety in human requirements. The necessaries of life are so few and simple, that a man is soon satisfied in regard to these, and desires to extend his range of enjoyment. His first -object is to vary his food; but there soon arises the desire of variety and elegance in dress; and to this succeeds the desire to build, to ornament, and to furnish -tastes which, where they exist, are absolutely insatiable, and seem to increase with every improvement in civilisation.**

* *Inquiry into the Nature and Origin of Public Wealth*, 2nd ed., 1819, p. 306 (1st ed. 1804).

** *Encyclopedia Metropolitana*, article "Political Economy," p. 133. 5th ed. of Reprint, p. 11.

Many French economists also have observed that human wants are the ultimate subject-matter of Economics; Bastiat, for instance, in his *Harmonies of Political Economy*, says.* "Wants, Efforts, Satisfaction-this is the circle of Political Economy."

In still later years, Courcelle-Seneuil actually commenced his treatise with a definition of want- "Le besoin economique est un desir qui a pour but la possession et la jouissance d'un objet materiel."** And I conceive that he has given the best possible statement of the problem of Economics when he expresses its object as "à satisfaire nos besoins avec la moindre somme de travail possible." ***

* *Harmonies of Political Economy*, translated by P. J. Stirling, 1860, p. 65.

** *Traité Théorique et Pratique d'Economie Politique*, par J. Q. Courcelle-Seneuil, 2me ed., Paris, 1867, tom. i. p. 25.

*** *Ib.*, p. 33.

Professor Hearn also begins his excellent treatise, entitled *Plutology, or the Theory of Efforts to supply Human Wants*, with a chapter in which he considers the nature of the wants impelling man to exertion.

The writer, however, who seems to me to have reached the deepest comprehension of the foundations of Economics is T. E. Banfield. His course of

lectures delivered in the University of Cambridge in 1844, and published under the title of *The Organisation of Labour*, is highly interesting, though not always correct. In the following passage* he profoundly points out that the scientific basis of Economics is in a theory of consumption: I need make no excuse for quoting this passage at full length.

* 2nd ed., p. 11.

“The lower wants man experiences in common with brutes. The cravings of hunger and thirst, the effects of heat and cold, of drought and damp, he feels with more acuteness than the rest of the animal world. His sufferings are doubtless sharpened by the consciousness that he has no right to be subject to such inflictions. Experience, however, shows that privations of various kinds affect men differently in degree according to the circumstances in which they are placed. For some men the privation of certain enjoyments is intolerable, whose loss is not even felt by others. Some, again, sacrifice all that others hold dear for the gratification of longings and aspirations that are incomprehensible to their neighbours. Upon this complex foundation of low wants and high aspirations the Political Economist has to build his theory, of production and consumption.

“An examination of the nature and intensity of man's wants shows that this connection between them gives to Political Economy its scientific basis. The first proposition of the theory of consumption is, that *the satisfaction of every lower want in the scale creates a desire of a higher character*. If the higher desire existed previous to the satisfaction of the primary want, it becomes more intense when the latter is removed. The removal of a primary want commonly, awakens the sense of more than one secondary privation: thus a full supply of ordinary food not only excites to delicacy in eating, but awakens attention to clothing. The highest grade in the scale of wants, that of pleasure derived from the beauties of nature and art, is usually, confined to men who are exempted from all the lower privations. Thus the demand- for, and the consumption of, objects of refined enjoyment has its lever in the facility with which the primary wants are satisfied. This, therefore, is the key to the true theory, of value. Without relative value in the objects to the acquirement of which we direct our power, there would be no foundation for Political Economy as a science.”

Utility is not an Intrinsic Quality.

My principal work now lies in tracing out the exact nature and conditions of utility. It seems strange indeed that economists have not bestowed more minute attention on a subject which doubtless furnishes the true key to the problem of Economics.

In the first place, utility, though a quality of things, is *no inherent quality*. It is better described as *circumstance of things* arising out of their relation to man's requirements. As Senior most accurately says, “Utility denotes no intrinsic quality in the things which we call useful; it merely expresses their relations to the pains and pleasures of mankind.” We can never, therefore, say absolutely that some objects have utility and others have not. The ore lying in the mine, the diamond escaping the eye of the searcher, the wheat lying unreaped, the fruit ungathered for want of consumers, have no utility at all. The most wholesome and necessary kinds of food are useless unless there are hands to collect and mouths to eat them sooner or later. Nor, when we consider the matter closely, can we say that all portions of the same commodity possess equal utility. Water, for instance, may be roughly described as the most useful of all substances. A quart of water per day has the high utility of saving a person from dying in a most distressing manner. Several gallons a day may possess much utility for such purposes as cooking and washing; but after an adequate supply is secured for these uses, any additional quantity is a matter of comparative indifference: All that we can say, then, is, that water, up to a certain quantity, is indispensable; that further quantities will have various degrees of utility ; but that beyond a certain quantity the utility sinks gradually to zero; it may even become negative, that is to say, further supplies of the same substance may become inconvenient and

hurtful.

Exactly the same considerations apply more or less clearly to every other article. A pound of bread per day supplied to a person saves him from starvation, and has the highest conceivable utility. A second pound per day has also no slight utility: it keeps him in a state of comparative plenty, though it be not altogether indispensable. A third pound would begin to be superfluous. It is clear, then, that utility is not proportional to commodity: the very same articles vary in utility according as we already possess more or less of the same article. The like may be said of other things. One suit of clothes per annum is necessary, a second convenient, a third desirable, a fourth not unacceptable; but we, sooner or later, reach a point at which further supplies are not desired with any perceptible force, unless it be for subsequent use.

Law of the Variation of Utility

Let us now investigate this subject a little more closely. Utility must be considered as measured by, or even as actually identical with, the addition made to a person's happiness. It is a convenient name for the aggregate of the favourable balance of feeling produced—the sum of the pleasure created and the pain prevented. We must now carefully discriminate between the total utility arising from any commodity and the utility attaching to any particular portion of it. Thus the total utility of the food we eat consists in maintaining life, and may be considered as infinitely great; but if we were to subtract a tenth part from what we eat daily, our loss would be but slight. We should certainly not lose a tenth part of the whole utility of food to us. It might be doubtful whether we should suffer any harm at all.

Let us imagine the whole quantity of food which a person consumes on an average during twenty-four hours to be divided into ten equal parts. If his food be reduced by the last part, he will suffer but little; if a second tenth part be deficient, he will feel the want distinctly; the subtraction of the third tenth part will be decidedly injurious; with every subsequent subtraction of a tenth part his sufferings will be more and more serious, until at length he will be upon the verge of starvation. Now, if we call each of the tenth parts an *increment*, the meaning of these facts is, that each increment of food is less necessary, or possesses less utility, than the previous one. To explain this variation of utility we may make use of space-representations, which I have found convenient in illustrating the laws of Economics in my College lectures during fifteen years past.

Let the line ox be used as a measure of the quantity of food, and let it be divided into ten equal parts to correspond to the ten portions of food mentioned above. Upon these equal lines are constructed rectangles, and the area of each rectangle may be assumed to represent the utility of the increment of food corresponding to its base. Thus the utility of the last increment is small, being proportional to the small rectangle on x . As we approach towards o , each increment bears a larger rectangle, that standing upon III being the largest complete rectangle. The utility of the next increment, II, is undefined, as also that of I, since these portions of food would be indispensable to life, and their utility, therefore, infinitely great.

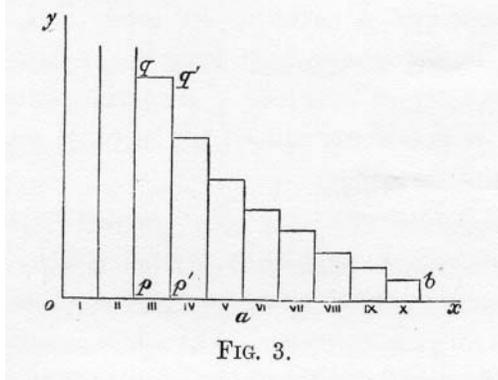


FIG. 3.

We can now form a clear notion of the utility of the whole food, or of any part of it, for we have only to add together the proper rectangles. The utility of the first half of the food will be the sum of the rectangles standing on the line oa ; that of the second half will be represented by the sum of the smaller rectangles between a and b . The total utility of the food will be the whole sum of the rectangles, and will be infinitely great.

The comparative utility of the several portions is, however, the most important point. Utility may be treated* as a quantity of two dimensions, one dimension consisting in the quantity of the commodity, and another in the intensity of the effect produced upon the consumer. Now, the quantity of the commodity is measured on the horizontal line ox , and the intensity of utility will be measured by the length of the upright lines, or *ordinates*. The intensity of utility of the third increment is measured either by pq , or $p'q'$, and its utility is the product of the units in pp' multiplied by those in pq .

* The theory of dimensions of utility is, fully stated in a subsequent section.

But the division of the food into ten equal parts is an arbitrary supposition. If we had taken twenty or a hundred or more equal parts, the same general principle would hold true, namely, that each small portion would be less useful and necessary than the last. The law may be considered to hold true theoretically, however small the increments are made; and in this way we shall at last reach a figure which is undistinguishable from a continuous curve. The notion of infinitely small quantities of food may seem absurd as regards the consumption of one individual; but, when we consider the consumption of a nation as a whole, the consumption may well be conceived to increase or diminish by quantities which are, practically speaking, infinitely small compared with the whole consumption. The laws which we are about to trace out are to be conceived as theoretically true of the individual; they can only be practically verified as regards the aggregate transactions, productions, and consumptions of a large body of people. But the laws of the aggregate depend of course upon the laws applying to individual cases.

The law of the variation of the degree of utility of food may thus be represented by a continuous curve pbq (fig. 4), and the perpendicular height of each point of the curve above the line ox , represents the degree of utility of the commodity when a certain amount has been consumed.

Thus, when the quantity oa has been consumed, the degree of utility corresponds to the length of the line ab ; for if we take a very little more food, aa' , its utility will be the product of aa' and ab very nearly, and more nearly the less is the

magnitude of aa' . The degree of utility is thus properly measured

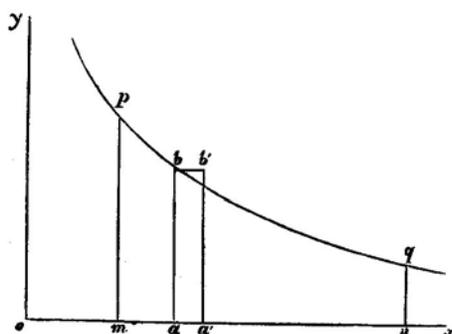


FIG. 4.

by the height of a very narrow rectangle corresponding to a very small quantity of food, which theoretically ought to be infinitely small.

Total Utility and Degree of Utility

We are now in a position to appreciate perfectly the difference between the *total utility* of any commodity and the *degree of utility* of the commodity at any point. These are, in fact, quantities of altogether different kinds, the first being represented by an area, and the second by a line. We must consider how we may express these notions in appropriate mathematical language.

Let x signify, as is usual in mathematical books, the quantity which varies independently—in this case the quantity of commodity. Let u denote the *whole utility* proceeding from the consumption of x . Then u will be, as mathematicians say, a function of x ; that is, it will vary in some continuous and regular, but probably unknown, manner, when x is made to vary. Our great object at present, however, is to express the *degree of utility*.

Mathematicians employ the sign Δ prefixed to a sign of quantity, such as x , to signify that a quantity of the same nature as x , but small in proportion to x , is taken into consideration. Thus Δx means a small portion of x , and $x + \Delta x$ is therefore a quantity a little greater than x . Now, when x is a quantity of commodity, the utility of $x + \Delta x$ will be more than that of x as a general rule. Let the whole utility of $x + \Delta x$ be denoted by $u + \Delta u$; then it is obvious that the increment of utility Δu belongs to the increment of commodity Δx ; and if, for the sake of argument, we suppose the degree of utility uniform over the whole of Δx , which is nearly true owing to its smallness; we shall find the corresponding degree of utility by dividing Δu by Δx .

We find these considerations fully illustrated by **fig. 4**, in which oa represents x , and ab is the degree of utility at the point a . Now, if we increase x by the small quantity aa' , or Δx , the utility is increased by the small rectangle $abb'a'$, or Δu ; and, since a rectangle is the product of its sides, we find that the length of the line ab , the degree of utility, is represented by the fraction $\Delta u/\Delta x$.

As already explained, however, the utility of a commodity may be considered to vary with perfect continuity, so that we commit a small error in assuming it to be uniform over the whole increment Δx . To avoid this we must imagine Δx to be reduced to an infinitely small size, Δu decreasing with it. The smaller the quantities are the more nearly we shall have a correct expression for ab , the

degree of utility at the point a . Thus the *limit* of this fraction $\Delta u/\Delta x$, or, as it is commonly expressed, du/dx , is the degree of utility corresponding to the quantity of commodity x . *The degree of utility is, in mathematical language, the differential coefficient of a considered as a function of x , and will itself be another function of x .*

We shall seldom need to consider the degree of utility except as regards the last increment which has been consumed, or, which comes to the same thing, the next increment which is about to be consumed. I shall therefore commonly use the expression *final degree of utility*, as meaning the degree of utility of the last addition, or the next possible addition of a very small, or infinitely small, quantity to the existing stock. In ordinary circumstances, too, the final degree of utility will not be great compared with what it might be. Only in famine or other extreme circumstances do we approach the higher degrees of utility.

Accordingly, we can often treat the lower portions of the curves of variation (pbq , fig. 4) which concern ordinary commercial transactions, while we leave out of sight the portions beyond p or q . It is also evident that we may know the degree of utility at any point while ignorant of the total utility, that is, the area of the whole curve. To be able to estimate the total enjoyment of a person would be an interesting thing, but it would not be really so important as to be able to estimate the additions and subtractions to his enjoyment, which circumstances occasion. In the same way a very wealthy person may be quite unable to form any accurate statement of his aggregate wealth; but he may nevertheless have exact accounts of income and expenditure, that is, of additions and subtractions.

Variation of the Final Degree of Utility

The final degree of utility is that function upon which the Theory of Economics will be found to turn. Economists, generally speaking, have failed to discriminate between this function and the total utility, and from this confusion has arisen much perplexity. Many commodities which are most useful to us are esteemed and desired but little. We cannot live without water, and yet in ordinary circumstances we set no value on it. Why is this? Simply because we usually have so much of it that its final degree of utility is reduced nearly to zero. We enjoy, every day, the almost infinite utility of water, but then we do not need to consume more than we have. Let the supply run short by drought, and we begin to feel the higher degrees of utility, of which we think but little at other times.

The variation of the function expressing the final degree of utility is the all-important point in economic problems. We may state as a general law, that *the degree of utility varies with the quantity of commodity, and ultimately decreases as that quantity increases*. No commodity can be named which we continue to desire with the same force, whatever be the quantity already in use or possession. All our appetites are capable of *satisfaction* or *satiety* sooner or later, in fact, both these words mean, etymologically, that we have had *enough*, so that more is of no use to us. It does not follow, indeed, that the degree of utility will always sink to zero. This may be the case with some things, especially the simple animal requirements, such as food, water, air, etc. But the more refined and intellectual our needs become, the less are they capable of satiety. To the desire for articles of taste, science, or curiosity, when once excited, there is hardly a limit.

This great principle of the ultimate decrease of the final degree of utility of any commodity is implied in the writings of many economists, though seldom distinctly stated. It is the real law which lies at the basis of Senior's so-called "Law of Variety." Indeed, Senior incidentally states the law itself. He says

"It is obvious that our desires do not aim so much at quantity as at diversity. Not only are there limits to the pleasure which commodities of any given class can afford, but the pleasure diminishes in a rapidly increasing ratio long before those limits are reached. Two articles of the same kind will seldom afford twice the pleasure of one, and still less will ten give five times the pleasure of two. In proportion, therefore, as any article is abundant, the number of those who are provided with it, and do not wish, or wish but little, to increase their provision, is likely to be great; and, so far as they are concerned, the additional supply loses all, or nearly all, its utility. And, in proportion to its scarcity, the number of those who are in want of it, and the degree in which they want it, are likely to be increased; and its utility, or, in other words, the pleasure which the possession of a given quantity of it will afford, increases proportionally."*

* *Encyclopedia Metropolitana*, p. 133. Reprint, p. 12.

Banfield's "Law of the Subordination of Wants" also rests upon the same basis. It cannot be said, with accuracy, that the satisfaction of a lower want *creates* a higher want; it merely permits the higher want to manifest itself. We distribute our labour and possessions in such a way as to satisfy the more pressing wants first. If food runs short, the all absorbing question is, how to obtain more, because, at the moment, more pleasure or pain depends upon food than upon any other commodity. But, when food is moderately abundant, its final degree of utility falls very low, and wants of a more complex and less satiable nature become comparatively prominent

The writer, however, who appears to me to have most clearly appreciated the nature and importance of the law of utility, is Richard Jennings, who, in 1855, published a small book called the *Natural Elements of Political Economy** This work treats of the physical groundwork of Economics, showing its dependence on physiological laws. It displays great insight into the real basis of Economics; yet I am not aware that economists have bestowed the slightest attention on Jennings's views.** I give, therefore, a full extract from his remarks on the nature of utility. It will be seen that the law, as I state it, is no novelty, and that careful deduction from principles in our possession is alone needed to give us a correct Theory of Economics.

* London: Longmans.

** Cairnes is, however, an exception. See his work on *The Character and Logical Method of Political Economy*. London, 1857, p. 81. 2nd ed. (Macmillan), 1875, pp. 56, 110, 224 App. B.

"To turn from the relative effect of commodities, in producing sensations, to those which are absolute, or dependent only on the quantity of each commodity, it is but too well known to every condition of men, that the degree of each sensation which is produced, is by no means commensurate with the quantity of the commodity applied to the senses. . . . These effects require to be closely observed, because they are the foundation of the changes of money price, which valuable objects command in times of varied scarcity and abundance; we shall therefore here direct our attention to them for the purpose of ascertaining the nature of the law according to which the sensations that attend on consumption vary in degree with changes in the quantity of the commodity consumed. .

"We may gaze upon an object until we can no longer discern it, listen until we can no longer hear, smell until the sense of odour is exhausted, taste until the object becomes nauseous, and touch until it becomes painful; we may consume food until we are fully satisfied, and use stimulants until more would cause pain. On the other hand, the same object offered to the special senses for a moderate duration of time, and the same food or stimulants consumed when we are exhausted or weary, may convey much gratification. If the whole quantity of the commodity consumed during the interval of these two states of sensation, the state of satiety and the state of inanition, be conceived to be divided into a number of equal parts, each marked with its proper degrees of sensation, the question to be determined will be, what relation does the difference in the degrees of the sensation bear to the difference in the quantities of the commodity?"

"First, with respect to all commodities, our feelings show that the degrees of satisfaction do not proceed *pari passu* with the quantities consumed; they do not advance equally with each installment of the commodity offered to the senses, and then suddenly stop; but diminish