
12 Marginal utility

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Marginal utility formed the bedrock upon which economists erected a new theory of social action. Within the space of two generations, between 1871 and 1912, all of economic theory's heavy beams – consumer choice, factor pricing, output decisions, the determination of interest rates and the value of money – were recast and reframed in the light of valuation at the margin. Although modification has continued to the present, the general principles of economics remain as they stood in 1912, the year in which Ludwig von Mises's *Theory of Money and Credit* applied marginal utility to the value of money. Except for Adam Smith's 'invisible hand' – or its modern equivalent, equilibrium – marginal utility is perhaps the most revolutionary idea in the history of economics.

Like other seminal ideas – such as calculus in mathematics and evolution in biology – marginal utility was discovered independently and simultaneously by more than one person. William Stanley Jevons in England, Leon Walras in France and Carl Menger in Austria all developed the idea, and used it to effect, in pathbreaking treatises. Jevons's *Theory of Political Economy*, Walras's *Elements of Pure Economics*, and Menger's *Principles of Economics* appeared within three years of one another, between 1871 and 1874.

Statements of marginal utility had appeared earlier. William Lloyd (1833) in Britain and Hermann Gossen (1854) in Germany defined marginal utility and explained its connection to price. Both were ignored. So, initially, was Jevons. In 1862, he presented a paper on marginal utility to the British Association for the Advancement of Science, who received it, said Jevons, 'without a word of interest or belief'. Not until the treatises of the 1870s did marginal utility exert a noticeable influence, and then it turned economics on its head.

The theory that was so thoroughly reworked was the English classical school of Adam Smith and David Ricardo. This school imputed the price of a good to the amount of labor that went into its production. 'If among a nation of hunters,' wrote Smith, 'it usually costs twice the labour to kill a beaver which it does to kill a deer, one beaver should naturally exchange for or be worth two deer. It is natural that what is usually the produce of two days' or two hours' labour, should be worth double of what is usually the produce of one day's or one hour's labour' (1976, p. 53) There were obvious exceptions to this principle. Land commanded a price even if no labor went into its production, and

non-reproducible goods, such as Rembrandt paintings, exchanged at prices that had little to do with the amount of labor that it took to produce them. Despite the large number of goods that lay outside its purview, however, the labor theory of value was the basic principle of price determination.

Marginal utility theory reversed cause and effect. The Mercedes-Benz automobile does not command a high price because much labor went into producing it. On the contrary: it is because a Mercedes commands a high price that so many engineers and craftsman can be paid to produce it. According to marginal utility theory, the prices of consumers' goods determine the prices of labor, and of land and capital as well. Although the direction of causation in marginal theory seems sensible, it leaves unanswered a vexing question: what determines the prices of consumers' goods? This question had confounded the classical economists and other social philosophers for a long time.

At first blush, it seems as if there ought to be a direct connection between the utility of a consumer's good and its price. If we, as consumers, find that a good is highly valuable to our purposes, then we ought to be willing to pay a high price for it. Correspondingly, if we find that a good is only marginally serviceable, then we ought not to pay much for it. However, this seemingly plausible relationship between use value and exchange value was contradicted by observation. 'Nothing is more useful than water, but it will purchase scarce any thing,' said Adam Smith. 'A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it' (Smith, 1976, p. 33).

Marginal utility theory resolved the water-diamond paradox and revealed a sensible relationship between use value and exchange value. Water, while essential to human life, is so abundant that we use it, not only to drink and to bathe, but also to mop our floors, sprinkle our lawns and wash our cars. If our supply of water were diminished, we would not deprive ourselves of the drinking water so vital to health; rather, we would wash our cars or scrub our porches less often. It is this least important or marginal use that determines the value of water to us. Because the marginal use value of water is low, the price we are willing to pay for it is correspondingly low. Conversely, diamonds are scarce relative to our desire for them. For many of us, our only purchase of a diamond is to express our enduring love for the most important person in our lives. The price we are willing to pay for such service is correspondingly high. If diamonds were as plentiful as cut glass, so that their sparkle commonly adorned ash trays and dog leashes, their use value would be low and so, too, would their price.

The principle of marginal utility gained wide acceptance by economists in the late nineteenth and early twentieth centuries. In Britain, the pioneer Jevons, along with Philip Wicksteed, Francis Edgeworth, William Smart and

Alfred Marshall, effectively expounded the doctrine. In the USA, Simon Newcomb, Irving Fisher, J.B. Clark and Frank Fetter exerted a wide influence. On the continent, Walras and his followers, especially Vilfredo Pareto, and Menger and his followers, especially Eugen Böhm-Bawerk and Friedrich Wieser, made a persuasive case for marginal utility theory.

While Menger and the Austrians held marginal utility theory in common with all economists, their treatment of the idea, and of theory generally, was sufficiently different from the others for it eventually to form a distinct line of thought. From the beginning, Jevons, Walras and their followers worked with a continuous utility function, $U(x)$, where U denotes the amount of utility, and x the quantity, of an economic good. Marginal utility was defined as the first derivative, dU/dx , of the total utility function. The Austrians, by contrast, focused on discrete, discontinuous value scales. The consumer has a set of ends, denoted abstractly by the ordered set $\{e_1, e_2, e_3, \dots, e_n\}$, that can be attained only with the use of economic goods. If the consumer has only one unit of a good, x_1 , she will use it to attain her most important end, which we designate as e_1 . If she has a second unit, x_2 , she will use it to attain her next most important end, e_2 , and so on. The marginal utility of x is the importance that the consumer places on a unit of x . This importance is imputed to the good from the least-valuable end attained. For example, if the consumer has three units of x , the marginal utility is the importance the consumer attaches to e_3 because that is the end she would forgo were she to lose a unit of x . The value scale enables us to define marginal utility without assuming the existence of a continuously differentiable utility function. In fact, the total utility function may be dispensed with altogether.

The notion of opportunity cost appears in the Austrian theory in a way that it does not in other theories. Consider our consumer again, this time with one unit of x , which can be used to attain e_1 or e_2 or e_3 , up to e_n . In choosing to attain e_1 , the consumer forgoes attaining e_2 through e_n . The most highly valued of these forgone ends, e_2 , is the opportunity cost of attaining e_1 ; e_2 is the end that would have been attained had x not been used to attain e_1 .

Another difference of the Austrian construction is its derivation of the law of diminishing marginal utility. Jevons postulated that the total utility function increased at a decreasing rate, so that marginal utility decreased as the supply of good increased. This assumption was justified on psychological grounds; we delight more in our first bite of ice cream than our second. In the Austrian treatment of utility theory, diminishing marginal utility theory follows from the value scale. As the consumer gets additional units of x , she applies them to attain successively less important ends. Consequently, the marginal utility of x diminishes as the supply increases. The marginal utility of x_3 is less than that of x_2 because the consumer places less importance on e_3 than on e_2 .

Corresponding to the law of diminishing marginal utility, there is also a law of increasing cost, which is nothing more than diminishing utility considered from another angle. If our consumer has on hand ten units of x , and gives up one of the units, the opportunity cost will be e_{10} , because that will be the end she forgoes by losing a unit of x . If she gives up a second unit of x , the cost will be higher, because she will forgo attaining a more important end, e_9 . If she gives up a third unit, the cost will be yet higher, e_8 , and so on. This is ultimately the reason that, as more of a good is supplied to the market, its cost will increase. The law of diminishing marginal utility implies the law of increasing cost.

Perhaps the most notable difference of Austrian utility theory was its treatment of measurability. The derivation of marginal utility from a total utility function required that utility be measurable, like weight or distance. Although economists such as Jevons realized that they could not yet measure utility, they assumed that it was in principle measurable, and that we would someday have the instruments necessary to carry out the task. Although Austrian economists, especially Wieser and Böhm-Bawerk, sometimes spoke as if utility were measurable, Menger's theory did not rely on measurability. In the Austrian scheme, the definition of marginal utility, and the principle of diminishing marginal utility, required only that ends and means could be sorted by rank. In technical phraseology, Austrian theory was ordinal rather than cardinal.

In the 1930s, at the persuasive instigation of John Hicks and R.G.D. Allen, economists replaced marginal utility theory with indifference curve theory, primarily because of the mistaken notion that indifference curves did not require utility to be cardinally measurable, whereas marginal utility did. Hicks and Allen directed their arguments against marginal utility theory as developed by Jevons and Marshall. They ignored the work of Menger, Ludwig Mises, Oskar Morgenstern and other economists in the Austrian tradition, who had long argued that measurability was untenable and unnecessary for utility theory. The marginal utility baby was thrown out with the cardinal measurement bath water because Hicks and Allen were unaware of Austrian advances in utility theory.

The Hicks–Allen development of utility theory has been especially unfortunate for teaching economics. Marginal utility is useful in conveying to students the fundamentals of the discipline. Even today, principles textbooks frequently introduce students to economics using marginal utility. Nearly as frequently, marginal utility theory is accompanied by the assumption that utility is measurable. A unit of utility is often denoted as a *utili*. Such an assumption impresses the thoughtful student as fanciful, a charge to which economic theory is prone anyway. A healthy dose of ordinal ranking would imbue utility theory with a realism that it badly needs.

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