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L V BIRCK

Routledge
Taylor & Francis Group
LONDON AND NEW YORK

First published in 1922

Reprinted in 2003 by
Routledge
2 Park Square, Milton Park, Abingdon, Oxon, OX14 4RN
or
270 Madison Avenue, New York, NY 10016

First issued in paperback 2010

Routledge is an imprint of the Taylor & Francis Group

British Library Cataloguing in Publication Data
A CIP catalogue record for this book
is available from the British Library

The Theory of Marginal Value
ISBN 978-0-415-31324-7 (hbk)
ISBN 978-0-415-60716-2 (pbk)
ISBN 978-0-415-31320-9 (set)

Miniset: History of Economic Thought

Series: Routledge Library Editions – Economics

THE THEORY OF MARGINAL VALUE

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Routledge
Taylor & Francis Group
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DEDICATED TO

ALFRED MARSHALL, CAMBRIDGE ;

HORACE WESTERGARD, COPENHAGEN

AND FRIEDRICH VON WIESER, VIENNA.

PREFACE

THE purpose of this treatise is not to give an entire system of economics, but to initiate the student in the methods, notions, or fundamentals of the marginal theory, and at the same time to carry him so far as to enable him to work out the problems for himself. Hence the first part of this book has been worked out in great detail, contrasting the rather condensed exposition of the difficult 4th and 5th parts, where the student, in a lesser degree, needs the guidance of his teacher. This book does not contain anything about the mechanics of economics, being reserved for a second volume.

In order to avoid delay the diagram blocks, used in the Danish edition, have been utilised in the English version; in some of the diagrams Danish words appear, and although their general sense is obvious, I would note the more important cases: In Diagram XIIa and XIIb, "maengde curve" stands for "curve of quantity; "Nödvendighedsvare" for "necessary," and "luxusvare" for "luxury." In Diagram XVI. (pp. 185–6) "arbulyst" stands for "disutility of labour," and "varens Nytte" for "utility of the commodity," and "pengenes-nytte" for "utility of money." In some cases the diagrams have been drawn in terms of "Danish Krone," but these have been interpreted in the text in terms of "English shillings."

I am indebted to Messrs. Fred Zeuthen, M.A. (Copenhagen), Hugh Dalton, M.A., Cambridge, and Thomas A. Joynt, M.A., Edinburgh, for valuable advice both as to form and matter, and to the latter for his patience and courtesy in reading of the proofs.

Dr. L. V. BIRCK.

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CHAPTER I

THE DISUTILITY OF LABOUR

1. The Economic Motive.—Mephistopheles does not appear to have grown wiser by experience when he agrees that his claim to Faust's soul shall be conditional upon the learned doctor becoming so much enraptured by the pleasures provided by the fiend that he must exclaim : " Oh ! stay, stay for ever, happy hour ! " For nobody has felt the happiness of a moment so intensely that he wishes to stay the fleeting seconds. Memories and anticipations make themselves present, throwing us out of our momentary happiness. Ascetic and pessimistic philosophy teaches happiness as depending on the subjugation of our desires ; by killing every germ of human desire we attain a state of happiness, the complete mental equilibrium in which our mind, drained of all desire is ready to merge in the " Nirvana." The optimistic, hellenic view of life is that happiness is attained through positive enjoyment and the avoidance of pain.

These two opposite theories of life have one truth in common : that a state of happiness is brought about by exterminating our desire, whether by killing it in its embryonic state or by drugging it with satisfaction.

Happiness, then—in so far as it can be defined—is identical with the cessation of desire, and the state of happiness is that point of complete satisfaction, of harmony of body and mind, in which state we are pained by no desire, because desire either has not yet been aroused or has already been satisfied. The further we are from this harmony the more pain we feel, and the greater is our discontent.

It is not a matter for economic science to decide, which of the two theories of life—the ascetic or the epicurean—is the right one ; only this—in our mind life we experience this striving to attain harmony, which is a characteristic of all life. The classical school of economists have, however, experience on their side when they maintain that human beings, from an egoistic point of view, regard happiness positively as the satisfaction of our desire, and negatively as the avoidance of pain, *i.e.*, the satisfaction of as great demands as possible in return for the smallest

possible sacrifice. This is the basis of the fundamental economic postulate—the rule that *our economic motive is maximum satisfaction and minimum sacrifice.*

2. The Working Hour.—In relation to his economic activity man is *the end* in his capacity of consumer, and *the means* in his capacity of producer. From this it must not be concluded that each individual is the end in view of his own activity, for we are only units in a community of many; but even the existing community is not the end in view, as every generation living in the present interval between the two eternities—the past and the future—is in itself a link in the chain of humanity. "Public welfare" has a longer range than thirty years; economic ethics cannot acknowledge benefit for the individual as an indicator of the correctness of an economic action

As a means man is a *working machine* which creates and supplies *energy*; our consumption refunds us the energy expended by our activity; part of the energy supplied through our consumption is expended merely in keeping alive—in "preserving the machine." We know from feeding-experiments that the functions of life consume a great part of the calories of the food, and that only part is transformed into muscle; only part of the energy supplied is converted into productive work. Progress, whether individual or universal, is founded upon the existence of a surplus of energy; part of the energy at our command we invest in the productions of our labour. The *workman* is possessed of *working-power* which produces "doses" of *energy*. These doses of energy may be useful in themselves (personal services) or be incorporated in things (*substances*); substances as well as services are thus economic goods. We now have the circle: Human energy—production—economic goods—consumption—satisfaction—energy. Compare: want—effort—satisfaction.)

Labour has two dimensions—*time* and *intensity*. As a third dimension quality might be mentioned (for instance, mental in contrast to manual labour), but this is in another plane and compares with the other two dimensions, as movement in time with movement in space.

As the correct unit of measurement—the unit of energy—cannot be defined, it is necessary in the following pages to employ *the working hour*, by which is meant something similar to Karl

Marx's reduced normal working hour, which is the product of average intensity and average skill.

By economic work we mean exertion of energy through the incentive of mainly economic ends, even if the object need not be the worker's personal benefit. The work must be *necessary for the purpose*, in the sense that the object would not have been attained without performance of the work in question or *equal* work. The singer who beats rhythm to the reapers is as productive as they by accelerating their speed; the government official who creates safe working conditions, the inventor who improves working-methods, and the manager who organises production, all perform indispensable work themselves. Not all indispensable work is remunerated, and much superfluous work is paid for—the wages thus being no indicator of the productivity of work; the relative indispensability of the individual *worker, not of the work*, determines wages.

By production—*i.e.*, applying working energy to substance—(the active and passive element respectively) we *produce* economic goods. To produce means converting substance into a shape in which it is *useful* and thus able to satisfy our demand. To *consume* means transforming goods into such a state that they are no longer able to satisfy our demand (destruction in an economic sense—not to be confused with destruction in a physical sense; a chair without legs is consumed, destroyed economically, without being destroyed physically).

3. The Curve of Productivity of Labour.—It is natural for a healthy human being to exercise energy, and when Simon Patten speaks of the "joy of work" he states something more than a paradox. What makes labour disagreeable is its monotony, and the fact that too much of it is required—the presence of an element of compulsion, breathless routine (specialising kills the joy of work) and often special aversion against repeat work. Unemployment is felt to be an evil, not only for economic reasons, but because idleness is tedious (there is a distinction between idleness and leisure); the joy of work is furthered by change of work, but the product of labour is increased by uniformity of movement.

The exercise of energy involves fatigue, which has objective as well as subjective effects. After conquering the sluggishness,

the yield of labour may increase during the first few hours, but afterwards it will decrease every hour (although a pause may again increase the yield) until it perhaps becomes negative; as far as piece-work is concerned the decrease in yield can be directly measured, but where the worker is adjunct to a machine and must follow its movements, the mistaken policy of long working-hours is proved by breakdown of machinery, accidents, and sometimes by the disappointing quality of the product (for instance, weaving-faults). This may be illustrated by diagram 1.

Along the abcissa or lateral axis in a system of co-ordinates we mark out the units of time, while the working intensity during the periods of time in question is marked out along the ordinate or perpendicular, the rectangles thus drawn up indicating the quantities produced during each unit of time (intensity multiplied by time).

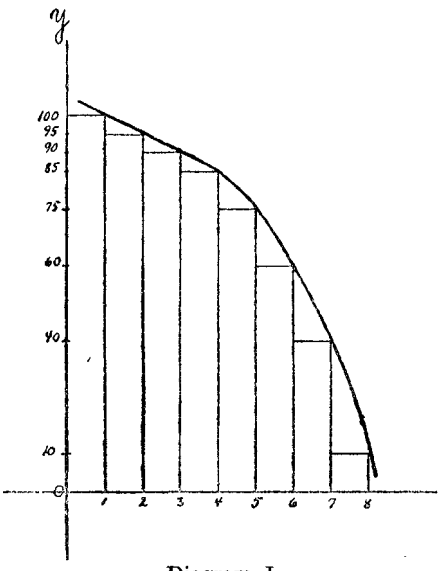

Diagram I

If the units of time chosen are sufficiently small, the connecting-line between the corners of the rectangles will form a continuous curve—the curve of working-intensity, which starts high and declines—thus illustrating the decreasing productivity of labour.

4. The Curve of Disutility.—The subjective effect of fatigue is a feeling of disinclination for work, and this may be increased by other elements, as, for instance, a loathing for the kind of work in question, monotony, etc. This disinclination is akin to pain. Few men can work for the sake of work itself; the work of the scientist or the poet need not, however, be attended by any disinclination; he is often driven on by a kind of demonic power (Socrates' "daimon").

But where this is not the case, and where work has ceased

to be a natural and spontaneous exertion of energy, it throws us out of our physical and mental equilibrium, and is felt as something onerous, varying in degree according to how far we are from our equilibrium, from the scarcely noticeable disinclination at the first dig with a spade, to the stinging pain after sixteen hours of work. The disutility of labour is thus dependent upon how much work a person has previously performed, and is not alike for all working-hours.

Supposing the disutility of the first instalment of work to be $u_l \cdot q_1$, the disutility of the second instalment will be somewhat larger, the worker being more fatigued after performing one instalment of work than before. The disutility of the second instalment might be described as $u_l q_1 \cdot q_2$, in which $q_2 > q_1 > 1$; the disutility of the third instalment is still larger; this is denoted by $u_l q_1 \cdot q_2 q_3$, in which $q_3 > 1$, and so on down to the n-th instalment, the disutility of which accordingly amounts to $u_l \cdot q_1 \cdot q_2 \cdot q_3 \cdot \cdots \cdot q_n$. That $1 < q_1 < q_2 < q_3$, etc., is in accordance with the *rule of gradually increasing disutility of the work* to produce the article in question. If we *assume* that the difference between q_1 and q_2 and between q_2 and q_3, between q_3 and q_4, etc., between q_{n-1} and q_n are small enough to be regarded as negligible quantities, we have $q_1 = q_2 = q_3 = q_4 = \ldots = q_n$. Thus we arrive at the following assumption :—

The disutility of the first instalment of labour amounts to $u_l \cdot q$, of the second to $u_l \cdot q^2$ of the third to $u_l \cdot q^3$, of the fourth instalment to $u_l \cdot q^4$, etc.

By assuming that the difference between q_2, q_3, q_4, q_n is infinitesimal we arrive at the hypothesis, that *the burdensomeness of work increases in geometrical progression corresponding to the arithmetically progressing increase in the quantity of work performed*, and that q = the rate of increase of this disutility—varies inversely with our capacity for work and proportionally with our susceptibility to pain or fatigue.

Without attempting to judge the correctness of this hypothesis, we must maintain that to adopt it will lighten our task without doing any harm. The formula $u_l \cdot q^4 > u_l \cdot q^3$ expresses clearly to the eye that we are comparing the third and the fourth working hour, and that the disutility of the fourth hour's work is greater than that of the third. Further, I shall not be tempted to draw any other conclusions from the designation of the disutility of the two

first working hours as $u_l(q + q^2)$, than I can if it was written $u_l(q + q \cdot q^2)$. If $u_l \cdot q$ is the disutility of the first hour the disutility of the t-th hour will thus be $u_l \cdot q^t$, that of the $(t-1)$ *th* hour will be $u_l \cdot q^{(t-1)}$. Assuming that I work t hours in all, we describe the t-th hour as the *marginal* hour, the work of *this* hour as the *marginal* labour, and the specific burdensomeness of this hour's work as the *marginal disutility* of labour. The *total* disutility of t hours work is, then :

$u_l \cdot q + u_l \cdot q^2 + u_l \cdot q^3 \ldots\ldots u_l \cdot q^t = u_l\ (q + q^2 + q^3 \ldots . + q^t)$ for which sum I use the contracted term $u_{l \cdot t}$.

From this it is immediately apparent that $t\ (u_l \cdot q^t) > u_{l \cdot t}$, *i.e.*, that the total disutility of the labour is less than the product of the time of working and the marginal disutility. This can be graphically represented (Diagram II.) by a system of co-ordinates, in which the hours are marked out along the abscissa and the disutility attending the work along the ordinate; in this case also we arrive at a curve, which illustrates the disutility of labour. The curve of disutility starts low, near the base, and ends high, thus indicating the increasing disutility of labour.

To compare time with pain, for instance, by writing the first + the second hour equal to $u_l(q + q^2)$ would be incorrect. Apart from the fact that the equation is misleading, because the disutility of four hours of work is more than twice as much as that of two hours, we are not justified in comparing quantity with feeling because physical quantities and mental conditions are incommensurable.

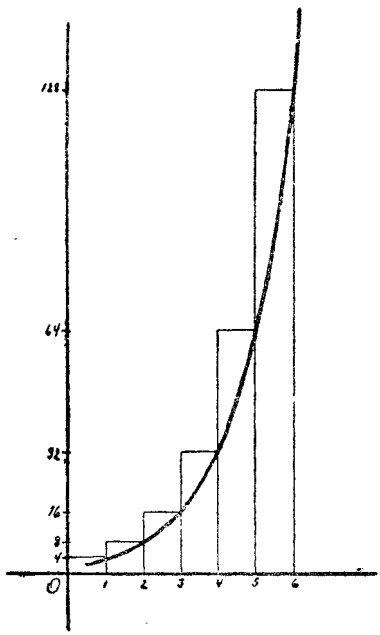

Diagram II

Work reveals itself in three ways : (1) as an objective quantity of work, (2) as the result of work, and (3) as a feeling of onerousness by the person who performs the work. Quantity and onerousness (dis-

utility) are like two quite different pictures of the same thing in two differently prepared mirrors—the retina of our eye and our feelings. Quantity of work applied and result cannot be compared either, even if the latter can be measured by the former.

The conditions of our work, then, are hard: objectively the yield decreases with increased working-hours, subjectively it causes us greater and greater discomfort each hour. If we add to this, that nature also grows more and more unwilling to yield the substance—the raw material—to which we apply our labour, and thus makes increasing resistance, we see that each human being as well as humanity generally in a sense works under the law of decreasing return. Capital and human ingenuity can mitigate this, for us, unfavourable fact.

5. Professor Lehman's Responsum.—The hypothesis of the logarithmic proportion between the quantity of work and the feeling of onerousness is far from unreasonable; Jevons quote several treatises, and has himself made some experiments with the object of measuring the increasing fatigue of uniform work, and his results confirm the hypothesis. Professor Dr. Phil. Alf. Lehmann has sent the following responsum to my inquiry:

"In reply to your inquiry concerning the variation in intensity of sensations and their relation to outside influences, I am able to give you the following particulars:

"Concerning the feelings of inclination, of desire, no experimental investigations are available. This is quite obvious, as any attempt to establish a formula for the proportion between the intensity of this feeling and outside influences must fail, because of the fact that we have no indicator of the intensity of the feeling. We cannot directly judge that the sensation at the present moment is a certain number of times more or less intense than at a certain previous moment. Bernoulli's mathematical expression of '*la fortune morale*' is therefore—as I have pointed out in my book, *Principal Laws of Human Emotional Life*, p. 195—a hypothesis, which in any case cannot be verified by experiment. But this does not preclude the possibility of testing it in a different way, *i.e.*, from practical life instead of through the laboratory. Here the external actions accompanying the feelings will certainly in many respects be available as indicators of the intensity of

emotions, and for this reason I do not by any means consider it impossible to verify Bernoulli's hypothesis, or even to find a more exact expression. I support this assumption on the fact that it appears to be actually possible to measure a certain feeling of disinclination.

" For feelings of disinclination generally the case is similar to that of feelings of inclination—we have no measure for them. But for that state of discomfort which accompanies physical and mental fatigue, it will in any case not be difficult to establish a certain measure without being too arbitrary. Fatigue itself, as a purely physiological state, can easily be made the subject of experimental investigation and be measured exactly through the decrease in the production of labour, either in quantity or quality.

" A rule may thus be established for the increase in fatigue in proportion to the quantity of work performed. When this rule becomes known, and we are able to form a not altogether improbable hypothesis as to the increase in fatigue, the outcome of this will evidently be a rule for the increase in disinclination in proportion to the quantity of work performed.

" The progress of fatigue has been examined repeatedly, for physical as well as mental labour; I have some time ago adapted a couple of experiments with a view to the question before me. Through a series of ergographic measurements of muscular fatigue I have found that fatigue measured by the number of maximum exertions required for the performance of certain work increases approximately in geometrical progression, as the work performed increases in arithmetical progression. By adapting a series of pedagogic experiments concerning intellectual fatigue—fatigue from mental labour—I arrive at approximately the same rule. A rather large class of children have been kept working for several hours without a break, and their fatigue has been measured at the end of each hour, through the number of mistakes made in test work (exercises from dictation, etc.). Here also it is proved that fatigue approximately increases in geometrical progression when the work performed—measured by the number of working hours—increases in arithmetical progression. (Compare Körperliche Aeusserungen Psychischer Zustande 2 Teil, Leipzig, 1901, Pg. 147–52).

" If now we dare assume that the disinclination accompanying fatigue increases proportionally with the latter, we would arrive

at exactly the rule mentioned: that the onerousness, the disutility of work increases in geometrical progression proportionally with an arithmetical increase in the quantity of work performed. But this assumption is directly at variance with experience. By ergographic measurements, where a number of maximal muscle-contractions are performed in a certain time, it is easy for the person subjected to the test to perceive that the onerousness to start with increases, and that simultaneously the work performed in each contraction continually decreases. But if the work is continued, the effort will finally be reduced to an almost constant quantity, which can be maintained for a very long time, and then the work is no longer disagreeable. Something similar is known from everyday life; for instance, on a long walk, where fatigue is also easily conquered by decreasing the speed of the walk; when the muscles are adapted for the work, the feeling of fatigue ceases. In this case there is no increase in the disinclination, which can be described as proportional with the increase in the work performed.

" The feeling of fatigue is, however, not the only deciding factor. When working to perform a certain task, the activity will be less satisfactory as the quantity of work, which can be performed per second, decreases. If the yield of work on account of fatigue has dropped to half the original quantity, we will not hesitate to say that the work is only half as satisfactory, and the smaller the performance per second, the greater the dissatisfaction with the work. This presumably applies more particularly to mental labour, where the dissatisfaction of the worker with his own performance increases, the greater the quantitative or qualitative decrease in the yield. Then there is really a disinclination, which can be said to increase proportionally with fatigue—that is, in geometrical progression—when the quantity of work performed increases arithmetically. And this disinclination may cause the worker to stop, even if the feeling of fatigue is only slight, for the sole reason that the result does not correspond to the effort. As this disutility, however, is not the only one resulting from the work—fatigue proper and possibly also other disutilities as well making themselves felt with varying intensity—the ' disutility of labour ' is probably rather complex, and it is then only as a rough approximation that the above rule can be said to apply.

" While these experiments concerning fatigue have fairly well elucidated the relations of disutility to the quantity of work performed, by employing a measurable consequence of this psycophysiological state as an indicator, I must accordingly assume that similar proceedings may be feasible in any case as far as certain of the feelings of inclination are concerned."

(Signed) ALFR. LEHMANN.

COPENHAGEN, *October* 10*th*, 1916.

CHAPTER II

UTILITY AND WANTS

6. Desire and Utility.—As work entails discomfort, which, furthermore, is increasing, there must be some motive for subjecting oneself to this pain, and this motive arises from the still greater discomfort which is created in us by our *unsatisfied wants*. Our wants are thus the " ultima ratio " of our efforts. If we cannot kill our desire by commonsense and self-control, we must buy the satisfaction thereof by means of a *sacrifice*; for instance, the disutility of labour. Already this shows that economic relations must be treated as *problems of equilibrium;* economic motives as well as economic forces continually tend towards a state of equilibrium which, scarcely attained, is again disturbed.

The consumption of energy in living creates our wants; they become evident as a feeling of discomfort, strong or weak, varying from a hardly distinguishable awakening discomfort to the pangs of hunger.

We *desire* to cause this pain to cease. The greater the need, the stronger is our desire and the further we are from happiness; he who is able to resign comes nearest to being happy, but " the coveting character bears Hell in his own heart." Consumption (actual consumption or use) of certain goods may cause our want to cease. Consequently we desire such goods; the pain caused by the want (*i.e.*, the pain we would feel by continually being without the goods) and the desire for the goods, will thus become equal. As soon as we desire a thing, a certain desirability or, to use an accepted term, utility, derived from our desire is attributed to it. A thing has only utility for us as long as we desire it, and we only desire it as long as we feel the pain of wanting it; only a hungry man cares for bread. This quality, which is equal to our desire, is termed *Utility*, which thus means a quality attributed to the goods and derived from our desire, which in turn has been created by our feeling of discomfort arising from the want—in other words, *Utility*, *Desire* and the *Pain of Want* are identical conceptions, covering one another and all measured by the strength of our feeling of pain The greater the pain caused

by our need, the greater our desire for those goods, the enjoyment of which allay the feeling of pain, and the greater the utility which our desire attributes to them.

Utility is thus not an objective quality of a thing; whether a thing has utility for me, depends upon my desiring it or not, and, consequently, the *amount* of utility depends upon *the strength* of my desire. Goods are only of importance for us if we come in relation to them, and economically they have only the importance we ourselves attribute to them. The individual measures the pain or disutility of labour against the utility of the thing, consequently pain is the basis of the conception of utility; but utility and pain would be incommensurable if both were not physical states.

7. Utility and Usefulness.—In contradistinction to utility—the subjective and, consequently, varying quality of a thing—we often speak of the objective and unchangeable quality of *usefulness* in a thing—which is this inherent, technical quality in a thing, that it *may* satisfy a possible want. Bread has always usefulness, because it has a certain taste, is digestible and nutritive; but it only has utility for me if I am hungry. A loaf of bread may save me from starvation, and its utility is immense; the same loaf would cause me disgust when satisfied, and has thus negative utility (*i.e.*, disutility). Utility is thus contingent upon, but cannot be measured by, usefulness. We might compare utility with the energy possessed by a piece of matter which has been raised to a certain height from the level, while we compare usefulness with the properties inherent in the matter because of its weight or form.

In economics we only deal with utility, the property attributed by the individual, *at a given moment*, to a thing according to his desire. The actual utility of a thing thus is an expression for how far the individual at a given moment is from the equilibrium of satisfaction as far as that thing is concerned. By the expression utility in the following pages we always mean the actual utility covered by the expressions "Utility" (Jevons); "rarèté" (Walras); "Nutz" (Wieser); "ophelimité" (Pareto); "Nytte" (Westergaard and Aschehoug), or the expression of daily talk—desirability.

It is misleading—as some authors do—to use the expressions subjective value and utility indiscriminately. While subjective value is a possible proportion of exchange between two goods employed by the individual to express a comparison between the utility of those two goods, utility is a kind of incorporeal substance, *i.e.*, a mental state of a certain intensity.

8. Measurement of Utility.—We treat utility (desire, pain of want) as if it were measurable; but ought we do to that? We can certainly not find any direct measurement for the strength of the feelings of other individuals, no more than of our own—in any case, never exact enough to find out how many units of pain we really suffer at a given moment. Edgeworth's hope of becoming able to measure the feeling of disinclination as we are able to measure the strength of the electric current is at the least sanguine. Even if we are able to measure certain physiological phenomena accompanying the feelings, as, for instance, to prove that feelings of fatigue are accompanied by a falling off in the pulse and the volumen of the arm, the existing apparatus only show us the direction and do not provide an exact measurement. But, anyhow, I know that I am able to compare, *i.e.*, measure and estimate my own feelings in as far as I know that my desire for one thing is stronger than for another. I have daily the alternative put before me, *to be without a thing I desire, or to make a sacrifice to obtain it*, or I have the choice between two things; and, consequently, I base my choice on an estimate of the difference between the strength of my feelings, at times to a nicety. If two feelings thus compared are of exactly the same strength, my fate will be the tragic one of Buridan's ass.

We are therefore entitled to presume that every individual is capable of measuring his *own* feelings and, presuming this, we might say that if a certain desire (and consequent utility) is estimated at a strength of 20 units, my desire for another thing, if felt with double the strength, will be 40 units. We make this measurement of our desire and of the *utility* of the thing in question every time we compare, *i.e.*, in production and exchange.

But to compare the feelings of two different persons, as done by many adherents of the subjective school, must be regarded as being inadmissible and, furthermore, superfluous. If the individual must buy or sell, he has his considerations of the proportion between two goods *for himself* fixed in the *subjective ratio of*

exchange; he knows how much he at the utmost will give, and the least he will accept. At the market he meets with other individuals, who also have fixed *their* subjective ratio of exchange; the mental process is the secret of the individual, hardly revealed to himself. We may compare the ratios of exchange; if, for instance, A calculates that a pair of boots will render him the same actual utility as three pairs of stockings, and B that they will have the same utility to him as six pairs of stockings.

But to compare the feelings direct will only lead us astray. If many economists are sceptical towards the mathematicians, one reason is that this comparison between the feelings of two persons only leads to elegant formulae. Walras' theory would certainly have predominated, if he had turned aside in time and dealt with subjective values. For utility is to us only the means to find the subjective value and, inasmuch as this is dependent upon the fluctuations in utility (*i.e.*, desire), to gain a starting point for the comprehension of the fluctuations in subjective prices. Once this is found we do away with all the psychological scaffolding (the conception of utility) and operate with tangible factors, the respective, subjective ratios of exchange of buyer and seller, in order to find what we are looking for —the ratio of exchange attained in an actual market.

9. The Law of Diminishing Utility.—Our desire decreases as we increase our supply of a commodity, and ceases when we are fully satisfied; consequently, the utility diminishes as we come nearer to the point of satisfaction; utility thus starts high and is finally nil. This rule of the *gradually decreasing utility* of goods was first advanced by *Gossen*. We know the rule from psychology as *Fechner's* rule; the influence must increase in geometrical progression in order to make the feeling increase arithmetically. That the utility of a certain increment is dependent upon the place it takes in the succession might be confirmed by anybody from his own experience If we describe the utility of the first unit as u_1 (or u_{d1} if we want to indicate that it is the first unit of the commodity D) and the utility of the second unit as u_2, and that of the third as u_3 and the n-th as u_n, we know from the rule of decreasing utility that $u_1 > u_2 > u_3 \ldots\ldots > u_n$ (the later the unit, the larger index, the less utility).

10. The Rate of Decrease in Utility.—The symbols u_1, u_2, u_3 . . . u_n, placed in succession, are termed a series of utility. The difference between them is termed the rate of decrease in utility; if this was alike at every point of the series and equal to the fraction $\frac{1}{q}$, the utility would consequently decrease in geometrical progression—a regularity which would only exist as an exception, and then only for a certain part of the series.

Suppose the following utility-schedule 64, 51, 41, 33, 26, 21, 17, etc., units of utility for respectively the first, second and third, up to the seventh unit of the commodity; if we continue, we would finally have a unit, the utility of which is nil or even negative (King Midas' experience). This schedule is expressed graphically in Diagram III.

The units of the commodity are marked out along the abscissa, while the different ordinates show the utility yielded by the different units.

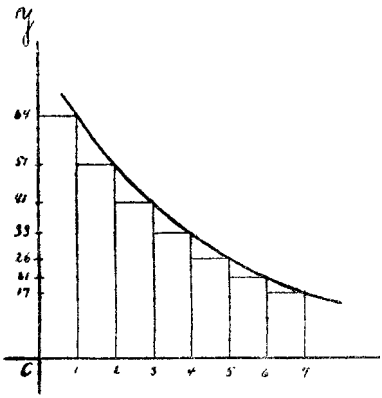

Diagram III

We may here note that the curves for different goods *do not start at the same level.* The first unit of bread meets with a very strong demand, that of butter with a somewhat smaller demand, and an article of luxury with a much smaller one, because we might do without it altogether. Diamonds meet with a very small demand, because a number of other demands must be satisfied first. Further, our *ability to consume* is not equally great for all goods; of some the possible consumption is very much limited, of others almost unlimited. It is interesting that nearly all the goods to the first units of which we attribute an enormous utility (for instance, food) arrive comparatively quickly at the point of satisfaction, after which a further unit would cause disgust, while the goods, which we meet at first with small desire (for instance, trinkets) can on the contrary, often be consumed in large quantities. There is no limit to the number of pictures I may hang on my wall and the number of diamonds I may use. Further, the rate

of decrease may vary. The first unit of some goods meets with a violent desire, the second, however, with a very small one; the rate of decrease is thus very fast. Of other goods we are perhaps no more eager to have the first unit than the second; the rate of decrease is then a slow one. This is graphically shown in Diagram IV, which shows the curves for two goods with, (*a*) a fast and (*b*) a slow rate respectively of decrease of utility. It will be seen that the curve of utility is steep in the first, but flat in the latter case.

But the rate of decrease is not the same right through; it

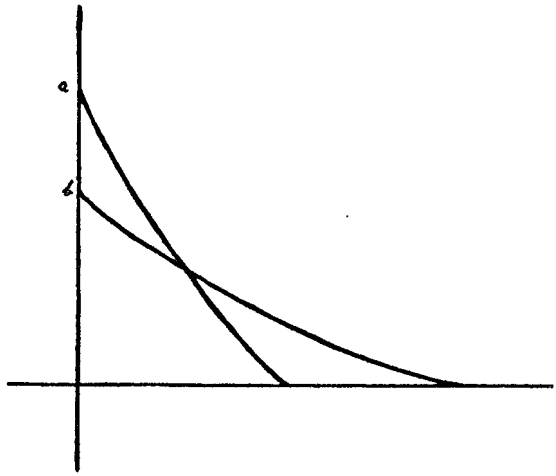

Diagram IV

changes often; perhaps it will be fast at the beginning of our consumption, but slow when the first demand has been satisfied; the curve of utility may then change its form from steep to flat; the change may take place so often that there is no regularity whatever.

Finally a utility curve may change its form as a result of a change in our relation to the thing in question. *Habit* may make an article of luxury a necessity for me (tobacco, coffee); a change in fashion may alter the utility I attribute to a powdered wig, to a crinoline or a corset. Fashion operates even in cases where nourishment is concerned. Advertisement may cause us to overestimate American flour. Every thing has in any case its own individual *curve of utility*, which shows what effect the successive consumption has upon the strength of my desire.

11. Marginal and Total Utility.—If a man possesses n units, we term the n-th unit the *marginal unit* and its utility the *marginal utility*, u_n; the total of the utility of the said n units—$(u_1 + u_2 + u_3 + \ldots u_n)$ written short u_t—is the *Total Utility*.

From the law of decreasing utility it appears that the utility derived from a certain quantity of goods depends upon, how much we have beforehand, and how far we are from complete satisfaction. If I have to part with some of my supply, my loss in utility on the same given quantity will depend upon how large the supply is. If I have to part with two units, the sacrifice of utility is greater if I am the owner of 6 than if I am the owner of 10 units.

The term *marginal utility* is really ambiguous, because I can speak of my last unit in my capacity of owner, seller or buyer. If I have 6 units, the 6th is my marginal unit as owner; if I must part with two of the six, the 5th will be the marginal unit of my sale, because I relinquish the 6th and the 5th; if, however, I must buy two more, my marginal unit will be the 8th (because I would then obtain the 7th and 8th unit). From this difference between what is my marginal unit in purchase and sale a Norwegian author Schönheider derives interest on loans. A man who has a daily income of six shillings will, by lending two shillings to-day, be lending his 5th and 6th, and consequently suffer a loss in utility because, by getting the money back to-morrow, he receives a 7th and 8th shilling (of less utility than the 5th and 6th).

Our community is, however, organised in such a manner that the seller is always a merchant who derives no direct utility from his goods, which for him are only *merchandise*, and that the buyer has himself produced nothing of the goods in question. The *seller* a merchant, has money (m) and therewith buys goods (g) for re-sale, and obtains for them money (m); the *buyer* produces services and obtains for these money (m) and therewith buys goods (g) for consumption, not for re-sale. We will therefore, in the following, pages deal with marginal utility as being only the utility of the last unit, the respective consumer can command *according to his income.*

The marginal utility decreases as the number of units of the goods owned by the individual increases, while the total utility increases: therefore *Marginal and Total Utility* vary in opposite directions. While $(u_1 + u_2) < (u_1 + u_2 + u_3)$, $u_2 > u_3 \ldots$

according to the rule of decreasing utility; this inverted proportion is the reason for what *Smithenner* has termed the demoniac in economics. Value has its origin in marginal utility; the *greater* the number of units the *greater* total utility, and the greater satisfaction, but also the *smaller* marginal utility and the smaller value. *Einarsen* calls this the paradox of value; that the maximum of total utility coincides with worthlessness, while value is determined by the higher marginal utility, which is conditional upon *scarcity*. General *Walker's* conception of progress is that marginal utility, and consequently value, becomes next to nothing, and he shows that this has been the case as far as many goods are concerned This is still the case on some South Sea Islands, where the population is not too crowded, and where land is not occupied and under private ownership; for, as we shall show later, private appropriation of land may also in communities, where land is plentiful, create a scarcity value for land and its produce. (Compare Proudhon's expression: "Autinomie de valeur").

It has become a matter for the subjective school of economics to show that value and human satisfaction do not follow the same lines, because the latter is determined by the total and the former by the marginal utility. The classical school has, like the practical business man, only considered value, and therefore assents to a social order where all efforts of those individuals, through whose hands the goods pass, tend to make the *goods valuable and humanity valueless*; and if it does happen now and again that labour attains high value, because there is an abundance of goods, it seems to be a world calamity, which "fortunately," is redressed by a crisis.

The formula $u_1 + u_2 + u_3 < 3 \cdot u_3$ means that the marginal utility is always less than the average total utility per unit.

If we have such abundance of a thing that the utility of the last unit for us is nil, we no longer desire to increase our stock; the marginal utility of the thing has reached its minimum and the total utility its maximum. We would only now continue to desire this thing, which has no direct, actual utility for us in itself, if by exchanging some of it we could obtain another desirable commodity (for instance, the stock in trade of a merchant).

Air is a clear example of the antagonism between total and marginal utility. We can obtain as much as we need without

sacrifice; if we should desire still more, air would have to be exchangeable; we have no use for our superabundance ourselves; its direct utility is thus nil, and air cannot have utility for us as merchandise, as everybody else is in the same happy position of having sufficient of it. If air could be monopolised, it would be rare and *scarce* (Cassel), *i.e.*, its marginal utility would be positive for a larger number of the community; air would then be valuable and the monopoly would represent capital for its owner.

12. Utility and Scarcity.—In order to be the subject of exchange, a thing must thus have positive marginal utility for one or more of the community; but to have positive marginal utility it must be *useful* and be present in limited quantity—*i.e.*, be scarce. When *Walras* employs the expression " rarèté " where we employ utility, he is not wrong inasmuch as the *scarcity* and the marginal utility of a thing follow identical rules. By scarcity we understand the shortcoming of a thing compared with an absolute sufficiency. The first unit is scarcer than the second; the second again more scarce than the third. If we express the scarcity in a case where I own one unit, as w_1, two units, w_2 . . . . and n units w_n, we arrive at $w_1 > w_2 > w_3 \ldots\ldots > w_n$.

The scarcity and *marginal value* of the supply—both relative conceptions—run concurrently, and both reach nil at the same time. The marginal utility of a stock of goods is thus a function of its usefulness and its scarcity; but scarcity is a relative, utility an absolute term. We can speak of total utility, but not of total scarcity. But this leads us no further, because we must then ask what determines the limit of scarcity? The reply is: The difficulty in producing the given quantity of the thing in proportion to the limit of demand. Marginal utility is thus associated through scarcity with the difficulty in producing the given quantity of goods.

In scarcity there is a subjective as well as an objective element; the latter depends upon the quantity absolutely in existence, the former on how much our demand amounts to.

Value being dependent upon scarcity (rarity) is in a way a sign of *poverty—i.e.*, a sign of difficulty in satisfying the demands of the public. In the sheep-rearing state of Wyoming the pre-war price of a sheep was a dollar. Land is of inconsiderable value, although it may be of fair quality. How poor that State is, meas-

ured by value, in comparison to that home of misery, New York, where scarcity of land has given square yards the value of thousands of dollars ! How much value might not be created if we were able to monopolise air ! Malthus may probably be right in his statement that a newly-born child will often be unable to produce what he needs for existence; but his existence will, at any rate, always create more *value* by raising the price of the existing supply of goods and means of production. Value is created by the disproportion between the demand and the supply available to cover it.

As utility without reference to the form and intrinsic qualities is an expression for our desire, every thing can, without regard to its own composition or form, have utility, and, presuming the *marginal utility is positive*, consequently be the subject of exchange.

Further, the thing—or the right to utilise it—must be *transferable* from one person to another, or, in any case, some means must be found to effect such a transfer; for instance, the indulgence of the Pope can be exchanged for money with the letter of indulgence as vehicle, and the royal favour through the written patent of office.

Any thing the product of labour or service, material or non-material which can be transferred, or for which some means of transfer from one person to another can be found, and which has positive marginal utility for one or more members of the community, may then be the subject of sale or exchange.

The outer form of the thing is thus immaterial to the valuation, the deciding factor is our desire. Indulgences and honours may be the subject of exchange to the same extent as obligatory rights, and these again just as much as physically appropriable things, and consequently are dealt with in the theory of value. Non-material means of satisfaction follow the general economic rules, for instance, the rule of decreasing utility. A titled landowner would, for instance, not care for the office of parish councillor, which would be coveted by a farmer. Further, the distinction between productive and unproductive consumption is immaterial from our point of view. Production of goods is only unproductive if the products are not desired by anybody.

The distillation of spirits and the making of guns are productive, subject to these conditions. Somewhat different are teleological considerations; into these there enters the social point of view,

the profit or loss to society or, in the last resort, ruin to the individual (public welfare); but this does not come within the economic category and in our non-moral theory of value we are concerned only with such economic considerations.

Consequently all goods come under treatment in the theory of value in so far as they have any relation to value, but only in that relation. Free goods—*i.e.*, such as are desired but of which there is no scarcity, and which are not comparatively limited, because everybody can have enough, have no positive marginal utility for anybody and are therefore without value—*i.e.*, do not concern the theory of value. Things which besides being useful are also rare (comparatively limited)—*i.e.*, of which some people desire *more*, have value and are called economic goods. Their usefulness conditions their utility; the disinclination of nature or the world to supply them conditions their scarcity and determines *where* on the scale of utility we are to *stop* and settle their value.

Readers who are familiar with other theorists dealing with marginal value will have noticed that we here speak of marginal value in a sense somewhat different from the current, according to which marginal utility is the marginal utility of an *infinitely small addition* to a given supply of goods. This may be advantageous for some purposes and has been so in the past; but now, when this path of reasoning is well trodden, this abstract thought appears to be of little use, and even harmful by keeping back many students who are not familiar with the differential calculus.

The fact is that we *do not* exchange infinitely small quantities of goods, but tangible quantities; often there is also a difference between the *unit of division and the unit of exchange.* A loaf of bread may be divided into perhaps a hundred pieces, but in spite of this one cannot buy less than a half-pound. The unit of division for pins is one pin, but it is not possible to buy less than a dozen; one cannot buy less than a house; one does not rent less than a flat. The marginal utility, which determines the value will then neither be the utility of an infinitely small increase, nor the utility of the last *unit of division*, but that of the last *unit of exchange.* If, for instance, I buy pins, it would neither be the utility of a fraction of a pin, nor of the last of the pins I buy, but the combined utility of the last twelve pins, which would determine my subjective price. *Jevons*, who points out that Mill's theory of price

suffers from exceptions, drops into the same pitfall himself, because he puts forth special rules for the sale of things which cannot be divided. This we avoid by regarding the marginal utility as being the combined utility of the units, one or several, which are comprised in the last *unit of exchange.*

13. Our Wants.—It is only in fairy tales that there exists a " general commodity " which, if touched with our wishing-wand, can be put to any use, and may thus satisfy *all* our wants ; the varying human wants must in the real world be satisfied by the consumption of hundreds of different goods.

We may divide our wants into the *primitive,* as, for instance, the demands for food, drink, warmth and air—created by our hunger, thirst, cold, or need to breathe—and the *developed.* While the first are *absolute,* the developed wants are *relative.* To these latter belong wants of a cultural nature—our ear demands harmonies of sound, our eye compositions of colours—our demand for music, art and literature ; and as the highest our desire to understand the link of cause and effect of scientific phenomena. While absolute wants will always be *physical* and determined by our *own nature,* relative wants will not infrequently be *non-material* and *socially determined.*

A number of wants are social—*i.e.,* not created by the nature of the individual, but arising from the intercourse of the individual with others. The human social nature demands power and authority or, for want of better, of *symbols* of esteem and power, the makeshift of the fool, the insignia of power : decorations, titles, pearls, and other shams desired in " Vanity Fair." These desires for the " fool's tool " are more fictitious than real ; we have here the peculiarity that our want and, consequently, the utility of the things may be dependent on conditions, which have nothing to do with the thing itself or our state of mind.

In itself a faked and a genuine pearl may satisfy our desire for beauty to the same extent but nevertheless we do not attribute the same utility to them. The utility of pearls, as is the case with *all* means of social distinction, is dependent upon their scarcity. While a surplus of bread would only alter the marginal utility which determines the value, but leave the total utility unaltered or even increase it, a surplus of pearls would not only alter their marginal utility, but also *detract from* their total utility,

because pearls create desire conditional upon their giving social distinction. The power of bread to satisfy is an inherent quality in bread; on the contrary, this is not the case with the power of pearls to satisfy vanity. If pearls were as numerous as pebbles *only few* would adorn themselves with them; bread we must eat, even if it costs nothing.

In another sense we say that part of our wants are socially determined, or rather are determined, by the social *class* to which we belong. An examination of our own consumption will reveal that our requirements as to housing and clothing are practically determined according to our class in the sense that one loses caste if the social claims are not complied with. However small a loss the individual would feel by relinquishing socially imposed requirements, the minority only have the courage to do so.

The wants of the poor are primitive, urgent, limited, uniform, physical and quantitative, while those of the rich are developed, weak, varying, unlimited, qualitative and of more mental nature. The primitive necessities of the rich are combined with developed requirements; their food must satisfy palate as well as appease hunger. It is, however, not quite correct to associate developed requirements with culture; where these requirements are only sensual, little mental development is needed. Clothes, good food and articles of splendour are more to the upstart than to the sage.

By the expression *collective want* we understand a necessity which does not exist for the individual, but only for individuals who co-operate as a community; as, for instance, the demand for a King, Military Establishments, National Honour. We have other wants, which originally were individual, but because they are common to everybody may be satisfied jointly; the ***mutual*** wants, for instance, for high roads. The want of the individual is not strong enough to compel him to undertake the work of constructing the road; added together the individual wants become strong enough to conquer the difficulties; the mutual requirement in this way assumes the character of a collective want.

We have contended that the wish of maximum satisfaction is the leading motive in all our economic actions. Against this it has been said: It is an egoistic point of view, which fortunately does not hold good; the human being is willing to sacrifice something for moral reasons. Even so the rule is correct: If a man without the

prospect of compensation in this life makes a gift to the public, he certainly attributes some satisfaction to his act, and, consequently, gains some "*utility*." He has perhaps a strong feeling of social justice, which does not leave him in peace, or he wishes to atone for some wrong. When *Tetzel* went through Europe with the "Klingbeutel" selling indulgence to repenting sinners, he was not far from doing the right thing; a man's repentance may, to a certain extent, be measured by his willingness to make a sacrifice.

Just as satisfied ambition is for many a generous reward for sacrifice, there is no doubt that a satisfied conscience is likewise a generous reward. In practice, even as an altruist, one acts on the rule of maximum satisfaction. In conferring a benefit the donor, not the receiver, is the gainer.

Often one want carries another with it; salt food creates thirst. There is no want which has so many consequences as that for a large house; if a reduction in the budget is necessary the start should be made by having a room less; the rest will adjust itself in due course. Otherwise our demands are connected according to our requirement, at one time for *harmony*, at another for *variation*.

The existence of our wants brings forth the goods which satisfy the wants. It does happen, however, that new goods appear, and that the demand first arises afterwards (the gifts of the new world—Tobacco and Potatoes). Wants are often for a certain article, but they are so frequently vague that the same want may in whole or in part be satisfied by another article, which is *substituted* for one previously used.

In quality there will always be some difference between goods, which may substitute one another in consumption. Advertisement creates demand to a great extent. Through it not only new goods for old wants are brought to our notice, but also quite new wants. A well advertised and well-established brand of goods may not only stand for a comprehension of certain qualities in an article, but also for the demand of a multitude of customers, created or adapted as a result of successive influences.

The demands of the individual become a habit until he arrives at a schedule of demands, which is the expression for the standard of living of a class, slightly adapted according to the character-

istics of the individual in question. We have then not only a *scale of utility* showing the decreasing utility of the various units, but also a *scale of wants* which ranges from the more necessary to the less necessary goods. Supposing my demand comprises three things, A, B and C ; let these have the following schedule of utility:

A	B	C
UNITS.	UNITS.	UNITS.
100	61	53
80	55	42
60	50	30
40	45	20
etc.	etc.	etc.

According to the rule of maximum satisfaction, I would start my selection with the first unit of A (A_1= 100 units of utility—UU), next A_2 (80 UU), then B_1 (61 UU), then A_3 (60 UU), then B_2 (55 UU), then C_1 (53 UU), then B_3 50 UU), etc., which means that in our consumption we move like a bee, now from one unit to another, now from one kind of goods to another, seeking the maximum satisfaction, now intensively down the schedule of utility for the same thing, now extensively from commodity to commodity along the schedule of demands, starting with the most *urgent* demand.

The first unit of the most necessary commodity, for instance, bread, has a very great utility. *Hobson*, however, warns us against over-estimating this factor, for even if it is correct that in the desert a loaf or a drink of water may mean life, and its utility accordingly be next to infinite, because all the possibilites of life and all the tortures of hunger depend on that piece of bread, normally existence is not at stake ; normally the first piece of bread means only an enjoyment, which may be postponed.

In addition our wants often overlap ; the demand for food is actually distributed over a number of things and it would be absurd to say that the first piece of bread and the first potato each have an infinite utility. In a case where it is a matter of satisfying hunger and I have eaten my first piece of bread, the first potato is not met with hunger, but only by a partly satisfied desire, and corresponds thus to the second potato, if potatoes had been the only nourishment available. This may be expressed in another way : certain goods are valued, not so much according to their