

PROBLEMS IN THE USE OF RATIONAL MAN THEORIES OF QUALITY IN MARKETING

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ABSTRACT

Theories based on "rational man" making perfectly informed, perfectly logical, choices between goods on the basis of their objective characteristics are important in marketing and marketing economics. Some of the theory also underpins theories based on more realistic assumptions. In this paper the theories are shown to have weaknesses which are serious from a range of epistemological viewpoints.

It is shown here that the theories have not been tested by their predictions and it is formally impossible to test them in this way. The assumptions are not simplified, but quite unrealistic. There is nothing to distinguish the theories from an infinite number of possible theories based on unrealistic assumptions. There are major logical and conceptual problems. The fundamental, boundary and ad hoc assumptions are so restrictive as to prevent application to the real world.

Fortunately, there is no shortage of alternative theories without these problems.

INTRODUCTION

One group of theories of quality is based on a perfectly rational "economic man" making optimal choices between goods on the basis of the objective characteristics of goods, with perfect information about these characteristics and their prices. These theories are important in marketing economics and marketing. They share many concepts with other theories which have more realistic assumptions. There are now well over 10,000 papers in the literature following from the basic premises established by Lancaster (1966, 1971, 1979), Becker (1965), Muth (1966), Rosen (1974), Houthakker (1952), Thiel (1952), Brems (1948, 1957), Leland (1977), Ladd and Zober (1978), Ratchford (1979) and their thousands of followers.

This paper is concerned only with the problems of rational man approaches. There are many alternative approaches in marketing, like the hedonic approach, compensatory models, perceived quality approaches, behavioral, behaviorist and heuristics approaches. There are also composite and complex approaches based on a range of theory and a wealth of observation found in marketing, in market economics (e.g. Bowbrick 1992), in agricultural economics, and in the new mainstream economics (e.g. Earl 1986), so there is no shortage of alternatives if one approach should be rejected.

WHEN IS A THEORY REFUTED?

Criticisms of a body of theory are often rejected on the grounds that a criticism that would be a clear refutation under, say, Popper's criteria, are not valid under, say, Friedman's (1953) criteria, especially under the idiosyncratic interpretation of this that states that theories with unrealistic (not simplified) assumptions and poor logic are to be preferred (e.g. Trail, 1995, Sternthal, 1995). Accordingly the criticisms here are designed to be valid under five distinct epistemologies. In all of these a distinction exists between a general theory and a model which is constructed of a particular market or situation.

- A. Most practitioners treat general theory as being a set of logical arguments or theories which need have no relation to reality. They can borrow appropriate strings of logic from several theories to construct a model which is intended to be as realistic as possible for a particular situation and which is intended to describe the truth for that situation alone. The specific model can be tested for the realism of its assumptions, the correctness of its logic and the accuracy of its predictions (throughout this paper it is recognized that simplified assumptions can be realistic.) The general theory cannot be tested for its realism, as it is not intended to describe reality. "Good" theory is theory which is logically correct and which has assumptions which are realistic for the specific situation being modelled. It is also easy to adapt to a real world situation, not requiring complete rewriting once a new assumption is introduced, for instance.
- B. Another epistemological position is that "consumer behaviour", say, has a similar significance to that of a physical science. It is a body of theory which describes the truth. It can be discovered by observation, and students can learn the truth from a book. Bits of this truth can be used to build up a model, in the same way that bits of chemistry can be used to make plastic. Both the theory and the model claim to represent reality and can be tested by assumptions, logic and predictions. In principle the theory is universally true, so models derived from it need not be tested with regard to the theory, though they may need to be tested with regard to other elements, like the data.
- C. This can be presented in a less extreme formulation where the body of theory describes a general tendency, and the truth is a generalization, not a causal law: e.g. "People usually judge the quality of a product by its price". It is clearly much more difficult to test a theory which is only a general tendency than one which is a law, and particularly if the variation is over time as well as between situations. The situation-specific model can be tested in the same way as under A. As the generalizations become less universal this epistemological position

approaches that of A, that is there is no reason to believe that the theory represents the truth, only that it may be appropriate for a specific model.

- D. Any logical theory based on any set of assumptions can be regarded as being potentially part of the "accepted theory". The accepted theory does not claim to describe the truth; rather it is a theory that is a consistently accurate predictor. Indeed, some people argue that unrealistic (not just simplified) assumptions are to be preferred.¹ Clearly, since there is an infinite number of such theories which would make very different predictions, a theory should only be "accepted" when it has been exhaustively tested for predictive ability. In principle, since the accepted theory is a consistently accurate predictor, models need not be tested. If they are tested, they can be tested only by their predictions, not by their assumptions or logic.
- E. This approach is often relaxed to include theories which frequently or generally predict well as being "accepted theory", or, more accurately, to refuse to exclude a theory purely because its predictions frequently fail. Again, testing such theories is harder than testing theories which are consistently accurate predictors. In what sense would it be meaningful to say that in 60% of markets (British, worldwide or for carpets?) people behave as though they believed that a high price indicated good quality (all people? most in the market? all people some of the time? some of the people all of the time?) (See Bowbrick, 1980). Since there is no particular reason to believe that the theory will be a good predictor in any one situation, each situation specific model must be tested before it is used.

The criticisms that will be made of the theory are fatal under all these epistemologies because a) it is shown that it is often impracticable to test theories, and that it is actually impossible to test these rational man theories, b) the fundamental assumptions of the theory are quite unrealistic - they are in no way a simplification, c) there are errors in the fundamental concepts and logic which invalidate the theory, d) the theory rules out virtually all of reality because of extremely restrictive fundamental assumptions, boundary assumptions and ad hoc assumptions.

TESTING THE PREDICTIONS

Because the theories do not make predictions about the real world their predictions are not directly testable and so the theories are not scientific in Pepper's sense, though he emphasizes that this does not make them useless, as the example of Darwin's theory

¹ This approach is fairly widely used interpretation of Friedman (1953); see for instance Trail (1995), Sternthal (1995). Friedman receives a passing mention, but not approval, by many economic methodologists, but does not appear to be known outside economics.

shows (Popper 1976, pp168, 171-80, 1972 pp69, 241-2, 267-8).

Indirect testing of such theories may be possible, examining whether specific models making use of Theory A predict better than models using Theory B, and particularly if they make predictions on matters that Theory B ignored. Obviously, the less reliable the tests, the more tests would be needed to reach a conclusion.

Testing of theories by their predictions is very difficult indeed. There is a strong body of literature dating from the Victorians² to the present day, stressing the difficulties of a meaningful test which would result in rejecting a theory which predicted badly. Even the strongest refutationist, Popper himself, did not believe that such tests were easy or reliable (Popper, 1959, p113; 1972, p257; 1976, p42). These difficulties are frequently cited by people who wish to say that their pet theory is not refuted by a string of poor predictions. When these arguments are applied to theories as opposed to models, it is questionable whether indirect testing is practicable. Some of the arguments are as follows:

A crucial test requires that one theory predicts different outcomes to its competitors, not just that it predicts the same outcomes more accurately, and ideally it should make predictions its competitors forbid. It is not easy to do such tests when competing theories attempt to explain the same phenomena and so tend to make the same type of prediction. It also requires luck in getting data that show up potential differences. Tests require that competing theories have the same boundary assumptions and cover the same domains. Some may be more accurate, some more reliable, some may be better for durables, some for fast-moving consumer goods. The theories being tested are only a part of the specific models, and the success of the predictions depends on the rest of the model as well: for example Ladd and Zober's (1977) findings (that some market level results did not appear to confirm that Lancaster's (1966) hypothesis applied in all cases) were attacked by Ratchford (1979) on the grounds that there was a long chain of untested logic and assumptions between Lancaster's assumptions on individual preferences and Ladd's review of observed market behaviour. Many of the models do not in fact use the theory cited: many which claim to be based on Lancaster or Rosen are straight market-level hedonic: Lancaster complains of this (1971 pp113-4), but the problem remains to the present day (see for example Larue, 1991; Williams, 1991; Ortono and Scacciati, 1992; Thomas, 1993; Berliant and Raa, 1991; McDanials, Kamlet and Fischer, 1992; Johnson and Fornell, 1987; Heffernan, 1990). Unwelcome results may be discounted because of data problems, experimental error, unforeseen

² "The ingenuity of these nineteenth century writers knew no bounds when it came to giving reasons for ignoring apparent refutations of an economic prediction, but no grounds, empirical or otherwise, were ever stated in terms of which one might reject a particular theory" Blaug (1980) p55

market changes etc. Indeed unwelcome results have a significantly lower probability of being published.

Most models are not intended to be a test of any one theory and cannot be used as a test. The part of theory in a model is part of a more complex, situation-specific logical model. Usually this theory is taken as given, and the model tests outcomes, such as whether consumers prefer product variants A, B or C. The prediction is not testable, as the firm launches only one of these variants, and one cannot see what would have happened if they had launched another, or if competitors had not launched new lines at the same time.

A search through the literature to find whether Theory A produces better predictions in x% of cases is invalid for these reasons and because it does not tell us anything about parent populations and sampling method.

While it has been argued above that indirect tests of theories in general are impracticable, it will be argued below that indirect tests of rational man theories of quality are impossible. This is because it is not possible to say in any situation whether the assumptions of the theory hold, so any unwelcome result will be dismissed with the comment "Obviously the assumptions did not apply here, so it was not a test."

In 25 years of literature searches, I have not come across any attempt to test these theories by their predictions in the light of these widely accepted problems. Nor have I come across any attempt to design a protocol under which experiments or a search of the literature might take place. This clearly makes rational man theories of quality meaningless under epistemologies D and E as there is nothing to distinguish them from theories based on assumptions like "People select their brand of soft drink because of rays transmitted by little green men on Mars". It also has the effect of making them invalid as theories under epistemologies B and C, in which case people who believe in these epistemologies, but who still use them in models effectively adopt epistemology A.

In a later section it will be shown that for rational man theories of quality it is not possible to say in any particular instance whether the assumptions hold, whether the indifference curves are of the unlikely shape assumed, for instance. This reinforces the message of this section on testing the theories under epistemologies B and C. It also has the effect of making tests of specific models under epistemologies A, B and C meaningless - if an unwelcome result is achieved, it can always be shrugged off with the words " Well, the assumptions probably did not apply in this instance".

TESTING ASSUMPTIONS AND LOGIC

Since it is not possible to test theories by their results, it may be asked whether it is possible to test them by their logic and assumptions alone. Under epistemologies A, B and C and some versions of D and E, a theory is clearly wrong if its logic is wrong, if its assumptions, implicit or explicit, contradict each other, or if its assumptions rule out all possible situations. Assumptions are not independent of logic: the assumptions on consumer preferences used in this research program are based on a lot of pre-existing consumption theory, so the logic of assumptions may be attacked.

We may distinguish between simplifying assumptions, assumptions towards applicability, fundamental assumptions, boundary assumptions ad hoc assumptions and ceteris paribus assumptions. Obviously some simplification is inevitable and desirable, and no criticism is made in this paper of the simplifying assumptions of the theory.

FUNDAMENTAL ASSUMPTIONS

The fundamental assumptions are ones which are considered by a researcher to be broadly true for all situations, not just those covered by his or her own theory. The assumptions are (a) on individual consumer preference, (b) on supply price of characteristics and, in a different way, (c) on the objectivity of characteristics³ are common to most approaches to quality, and some or all are assumed in most other approaches, though they are generally implicit or taken to be self-evidently true. In view of the fact that there are well over 10,000 papers in this research programme, it would be surprising if there were no exceptions to such generalizations, but I have not come across them in an extensive review.

CONSUMER PREFERENCES

A fundamental assumption of this research program is that people always prefer a characteristics mix with a higher level of one or more characteristics: without this one cannot get to the second stage of the analysis. This is set out most rigorously by Lancaster: his assumptions "simply carry over traditional preference theory, applying it to collections of characteristics instead of to collections of goods" (1971, p20) in order "that the consumer's preferences can be expressed in terms of an ordinal utility function of the neo classical kind with all its first order partial derivatives positive" 1971 p21).

³ I use "characteristics" to refer to objective properties of a good, and "attributes" to refer to subjective properties. A good is a unique mixture of characteristics, a blend of coffee perhaps, while coffee is a group of goods.

He assumes transitivity, completeness, continuity, strict convexity, non-satiation and all characteristics positively desired, in order to produce an indifference curve looking like those in the textbooks (Figure 1).

A fundamental error arises here from uncritically applying the theory appropriate to one type of situation to a completely different one. There is a failure to realize that in standard economics we are dealing with two goods which are bought separately to be consumed separately, bread and kerosene for instance. When we talk of quality the characteristics of a good are necessarily bought together and are usually consumed together.

Table 1 shows the extreme case where two characteristics of a good are consumed together but they are valued independently: the value of the bread is not affected by the amount of kerosene it is mixed with. Here the marginal utility first increases with level of characteristic, then becomes constant then falls. When marginal utility is increasing, the consumer is happier with all characteristic A or all characteristic B. As levels increase, a bull's eye appears, surrounding the optimum mix. In order to get curves something like those assumed in the theory it is necessary to assume positive but declining marginal utility at all levels for all characteristics.

It is more usual that the satisfaction from one characteristic depends on the level of other characteristics. With the characteristics sugar and acid in a bottle of wine for instance, we get a set of indifference curves like those in Figure 2. The consumer prefers a medium-sweet, medium acid wine, so this is the highest point on the indifference surface. A wine that is slightly too acid or too sweet will fall on a lower indifference curve. Unlike the theories of Lancaster, Rosen and others in the research program, this does not imply that consumers are happiest with a very sweet, very acid wine. This "bull's eye" indifference surface will be the first approximation in a large number of real-life situations.

It has been argued in Bowbrick (1992) that a wide range of shapes of indifference surfaces is likely to be common when real consumers consume real products. Some of these are set out in Figures 3 to 6. Figure 3 shows a two-peak indifference curve, apples for dessert and cooking - and it is one of the attractions of characteristics based theories like Lancaster's that they are supposed to handle purchases for different uses quite easily. Figure 4 shows a pure product being preferred to a mix. Figure 5 has indifference curves being points on the product possibility curve. Figures 5 and 6 are different ways of plotting preferences for a mixture of kerosene and milk when the mix tastes horrible. The indifference curve consists of points on the axes. In Figure 6 the diagonal is the product possibility curve and any indifference curves would be points on

this curve. These figures have been simplified, as it is not possible to explain their full complexity in the space available.

A fundamental logical error that pervades most of the theories discussed is that they use a single characteristics space which may be described by using the simple descriptors for axes "Characteristic A" and "Characteristic B". In fact, the indifference surface for sugar, say, will be of a different shape depending on whether one is talking of sugar in a cup of tea, sugar in a sausage, sugar in a meal, sugar in one's diet or sugar in total consumption (If indeed people have a concept of sugar or chili or acid in total consumption). With sugar in a cup of tea the product possibility curve is determined by the fact that the quantities of tea, sugar and milk must add up to one cupful.

The implications are shown in figures 8a and 8b, where the same indifference curve is plotted in several spaces, first for two more or less complementary characteristics, chili and garlic, and second for two that are less likely to be complementary, sugar and chili. The shape of the curve is markedly different in each space, even though it is the same individual's preference that is plotted.

Similar changes in the shape of the indifference curve can be obtained by defining the characteristic differently, as "wine sugars" rather than as "sugar" for instance.

The major changes in shape that result mean that the casual switching from one characteristics space to another is far from trivial in effect. The scale of the problem is shown by the fact that Lancaster, say, uses at least a dozen different characteristics spaces without realizing he is doing so, and without adjusting the shape of his indifference curves accordingly. For example:-

1. Total amount of characteristic in total consumption. This requires the assumptions of linearity and additivity. It appears to be the characteristics space used for the basic paradigm case.
2. Total amount of characteristic in the diet (1971, p17).
3. Total amount of characteristic in a single unit of a good. This is the space used for the automobile example (1971, pp157-174).
4. One axis being "Cleaning power per dollar" for goods in the product group detergent (1966, p153). This conflates two characteristics and introduces concepts like value for money. It does not appear in Lancaster (1971).
5. Level of characteristic obtained from one or more goods in one product group. (1971 pp125-139)
6. Characteristics per unit of a good (1979 p28).
7. A space with a "normalized" efficiency frontier, implying some kind of "normalized" definition of characteristics (1971). This is used for his second paradigm case. In fact this may be created starting from any of the six previous

spaces and be related to total consumption, to an automobile etc, so there are a dozen spaces used.

In the examples given here none of the fundamental assumptions on the shape of indifference curves hold. Since contamination is a potential problem with all foodstuffs and with many other products, the indifference curve on at least one pair of axes will be similar to that for milk and kerosene. Since the research program requires that the assumptions apply for all characteristics of all the goods under consideration, it is not applicable in these cases. It must be concluded that the assumptions of rational man apply for any real life situation

It must be emphasized that if an assumption is changed, or if logic is shown to be incorrect, all subsequent analysis must be reworked, so changes at the fundamental level mean that the whole theory must be abandoned.

SUPPLY ASSUMPTIONS

The supply side assumptions of the research program are generally implicit, with the suggestion that they mirror consumer preferences and that at equilibrium one can only get a characteristics mix with more of any one characteristic by paying more. Again it is a fundamental assumption: if it does not hold, the optimizing criteria do not apply; one cannot use standard indifference curve analysis, as the budget line is shaped quite differently.

A fundamental error arises from applying an analysis based on separate goods to a situation where the characteristics of a single good are necessary supplied together. While it is reasonable to assume that it costs more to buy a greater quantity of any good, there is no obvious reason why it should cost more to buy a good with more of any one characteristic.

Figure 7 gives an example where this assumption does not apply. Here the price for wine reflects consumer demand, with medium-sweet wines getting higher prices.⁴ The iso-cost lines are circular and the indifference curves are bull's eyes. The optimum purchase is a trade-off between quantity and quality not shown in a two dimensional diagram. It bears no relation to the standard optimizing position of Figure 1.

Figure 7 shows one possible way in which prices can be formed, and the combination of Figures 3 to 6 with possible supply prices gives a wide range of

4 This depends on the supply situation: if medium-sweet, medium-acid, wines are much easier to produce and market they could be cheaper than the less preferred wines.

possibilities. This means that it is not possible to derive an individual's preferences from observing his or her purchases, so it is not possible to use observation to determine whether the assumptions apply in any case. There can be few commodities for which it is possible to plot half a dozen purchases by an individual under identical circumstances - price and availability of product and alternatives, income, amount in the pantry already and so on - and for none will there be sufficient observations to plot a multi-dimensional indifference curve.

It can be shown that market conditions particularly in price-taking markets do not imply that the cost of production is the main determinant of the market price of a characteristic. A stronger case can be made in price-making markets, but it is questionable whether such markets can exist where the assumptions of rational-man theories hold - when all buyers perceive exactly the same characteristics in the same amounts in a good, price making is not feasible.

When the input characteristics are different from the output characteristics (with art, agriculture and most industry for instance) there is no obvious reason why it should cost more to produce a product with more of an objective characteristic. It is perhaps more likely when a product is made by mixing ingredient characteristics or by assembling components, but even here the assumptions of neo-Chamberlinean approaches like Lancaster (1979) do not hold.

Hedonic Prices

Rosen (1974) is primarily an attempt to justify the long-established hedonic approach dating back to Waugh (1928) by arguing from rational man assumptions, Lancaster (1966, 1971) is often interpreted in the same way, and Ladd and Zober (1978) depends on there being a strong link between rational man and hedonic theory.

There is however, a major distinction between the hedonic price⁵ and the price on which a purchase is made by rational man. Rational man bases it rather on a price list which gives the price of all options open to him. In Figure 7, all points corresponding to an available product would be on the price list and the buyer might choose any of them. A regression curve on the other hand would not take into account goods which were not sold in the time period, and would give little weight to goods which were sold in small quantities, though they were all viable options. If most of the observations were in the

5 "Hedonic prices are defined as the implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amount of characteristics associated with them....Econometrically, implicit prices are estimated by the first-step regression analysis (product price regressed on characteristics) in the construction of hedonic price indexes." (Rosen, 1974, p34).

SW quadrant of Figure 7, both characteristics would appear to be positively priced, if in the NE, both would appear to be negatively priced and if in the SE or NW, one or the other would appear to be positively priced, the other negatively. If observations were scattered randomly, there would be a poor fit with a linear regression. A linear regression is based on observations over a period in time, while the consumer's decision is made at a moment in time, when inside a shop perhaps. It is not uncommon for different classes of customers to face different prices or to buy at different times (with prices changing over the day in street markets, stock markets and commodity markets). It may be possible to run regressions on price lists rather than transactions but this is usually in price making markets where the assumptions of the theory do not hold. It must be asked, though, why anyone having a price list should want to work out hedonic prices: their decision can be made by ranking the expected utility from different purchases, then comparing prices.

While hedonic prices have their value in market level analysis they are not the prices relevant to individual consumers in their purchase decisions. The weaknesses of rational-man theory do not mean that hedonic theory which is based on other premises is wrong.

SUBJECTIVE AND OBJECTIVE

Most of the research program is founded firmly on the assumptions that:

- All goods have objective characteristics, and consumers' purchase decisions are made solely on a subset of these characteristics.
- All consumers base their decisions on the identical subset of objective characteristics.
- All consumers perceive the objective characteristics perfectly and they perceive them identically, though they may value them differently.
- All consumers always make optimal decisions, maximizing their utility.

Lancaster bases his theory formally on individual perception and objective characteristics because:

"If different individuals were to 'see' the same goods in fundamentally different ways, there would be little point in devising an analysis to take account of the objective properties of goods. For then either it is

meaningless to speak of "objective" properties, or those properties which are objective are irrelevant to people's relationship to goods." (Lancaster, 1971 p6)

The assumption is that consumers make their decision on objective characteristics and the implicit assumption is that if they do not know the objective characteristics, they act on what they believe them to be.

Other approaches to quality are consistent with the view that individuals make their choices on the qualities that they attribute to goods. These attributes need not be linked to characteristics at all or may be linked in a highly subjective, even irrational way - what objective characteristics determine the purchase of a magazine? a painting? a house? a meal? The buyer may use observation to try and determine the characteristics, as a guide to what the attributes are. Attributes are not necessarily a guide to what characteristics are.

The research program is very different in content and logic from the interpretation of market level hedonic analysis which goes: "Goods with what the researcher perceives to be more of characteristics X, Y and Z get the highest price, so if the marginal producer switches to a product with more X, Y, and Z, he or she can expect to get a higher price" or "Market research has been carried out on the attributes consumers associate with the goods on the market. Hedonic analysis shows that goods with more of attributes A, B, and C get higher prices. If the marginal producer can raise the attributes A, B, and C (by advertising or changed product specifications), he or she can expect to get a higher price." Neither of these interpretations requires that decisions are made on objective characteristics - at most characteristics are taken as proxies for attributes.

Nearly all of marketing, much of market economics and many other areas of economics like the economics of information are dedicated to the proposition that these assumptions on objectivity and perfect knowledge are false. There is a wealth of evidence to show that in most cases people do not perceive characteristics or prices correctly, that they do not relate characteristics correctly to the satisfactions they produce, and that there are major differences between individuals in these respects. Billions of pounds a year are spent on advertising to increase this discrepancy.

It is not surprising therefore that most practical applications of the research program and some theoretical approaches drop these formal assumptions, usually implicitly, and use subjective and objective interchangeably or use only subjective, without examining the implications.

Let us consider the case where the good has objective characteristics and the

producer, the retailer, the market researcher, Consumer A and Consumer B all have their own perceptions of that objectivity. Let us then make the assumption that these people can plot their own indifference curves in relation to supply (an extraordinarily unlikely assumption, but one favouring the rational man approach).

These people may all take different characteristics into account, with different characteristics being relevant to their decisions. There may be little overlap between a producer's specifications and the characteristics a consumer considers important. Some specifications that strongly influence the satisfaction a consumer gets from a television set, say, are invisible to the consumer. On the other hand a consumer may be influenced by a non-existent characteristic like the dietary fibre content of meat. This means that there may not be any broad level of agreement on the axes within which the preferences and supply are plotted.

Even if everyone thought the same characteristics relevant, there are many ways of perceiving and measuring a characteristic - even if perfect knowledge is assumed. For example people may perceive the engine power of a car in terms of cubic capacity, BHP, acceleration from a standing start, acceleration to pass at high speed, top speed or ability to pull a caravan. Even with perfectly accurate perceptions, the characteristic will be plotted on different axes with different scales.

The perceptions may simply be inaccurate, so that even consumers who are in total agreement on what axes to use will plot a given good in a quite different space. When people realise that their perceptions may be inaccurate, risk and the strength of their belief in the accuracy of their perceptions become factors.

A distinction must be drawn between preferences (indifference curves) drawn against an individual's perception of level of characteristic, first where the indifference curve is related to abstract perceived quality and, second, where it is related to the perceived level of quality of specific goods. It would be surprising if an indifference curve relating to certain branded goods were the same as that for the characteristics in those goods (and both would be very different if they could be plotted against objective characteristics).

The problem then arises of how an outside observer, the market researcher perhaps, could plot all these curves and observations on a single diagram.

The option of relabelling the axes as "Perceived level of Characteristic A" and "Perceived level of Characteristic B" is only open when all consumers consider the same characteristics relevant and they perceive and measure them in the same way. There is then the problem that each consumer may plot a single good in a different place.

Similarly if two individuals have identical indifference curves in terms of objective characteristics these will be plotted in different places. Even with readily identifiable branded goods, there will be no agreement on budget lines.

Another option, which is quite impractical, is for the individual to identify each point on his or her diagram by pointing out a good which corresponds to it. The market researcher then places this point on the appropriate point of his or her own diagram. In principle all individual's curves could be plotted in terms of the subjective perception of another individual, with each good occupying one point. If, however, an individual's indifference curve has all the properties of transitivity, continuity, strict convexity, non satiation and all characteristics positively desired when plotted against his or her own perceived level of characteristics, it is extremely unlikely that the same will be true if they are plotted against the market researcher's perceptions and using his or her perceptions of which characteristics are relevant, what scale is used and what level of characteristics the good has.

The main attraction of the characteristics approach lies in its claim to tell us what will happen to sales when the characteristics content of a product is changed. There may however be no change in perceptions even when characteristics change or large changes when characteristics remain constant. This may arise from changes in end use, information available, search costs, advertising, availability, location, uniformity, tolerances, guarantees, and the reputation of the shops that sell the product for instance. Potatoes for example have changed from an unhealthy fattening food to a slimming food. The importance of attributes, including the construction of mega attributes, is covered in more detail in Bowbrick (1992).

Clearly, the rational man analysis can only work under extraordinarily unlikely assumptions of all consumers having perfect knowledge etc and this alone suggests that the theory is of little or no applicability.

If one is to produce a theory where the investigating market researcher is all-knowing, as in the rational man theories, why should they not be all knowing about the attributes on which decisions are made, rather than just on the characteristics on which they are not made?

In the previous sections, on preferences and on supply, it was shown that it is not possible to plot an individual's indifference surface from observation of actual purchases, and more reasons have been given here. The alternative of self explication lies outside the research program, but again, it does not give a method of plotting an individual's indifference curve against objective characteristics. The diagrams of the rational man theories cannot be drawn with practical examples.

BOUNDARY ASSUMPTIONS

Few theories are intended to work in all possible situations. Boundary assumptions set out those areas where the theory is intended to work, and the theory can only be tested within these boundaries. The rational man theories share the fundamental assumptions on human behaviour, but each theory works only within its own boundaries, so comparative testing may not be possible.

The example of Lancaster (1966, 1971, 1979) may be given, as his is far and away the most cited theory of quality and indeed is one of the most cited papers in economics, and is presented more fully and more rigorously than others. It dominates the economic approaches and has a strong influence in marketing. Lancaster's theory only works where his boundary assumptions apply: his optimization and aggregation procedures do not apply otherwise. His assumptions include:

a) The satisfaction from a unit of a characteristic is independent of the form in which it is supplied - the satisfaction is obtained from one gram of protein whether it comes in the form of steak or potatoes.

b) Any two goods can be mixed, and it is the total quantity of the objective characteristics in consumption that determines satisfaction. (Lancaster 1971).

These assumptions have been strongly criticized on the grounds that they are far too restrictive and almost never apply in practice (Hendler 1975, Ladd and Zober 1977, Lucas 1975). The theory could only work when a consumer got the same satisfaction from one very sweet orange and one that has no sweetness at all, as from two moderately sweet ones, when two size six shoes were equivalent to one size twelve, and when a Mozart sextet was 20% better than a quintet. In fact, the only cases where these assumptions apply are cases similar to the agricultural economist's least-cost pigfeed problem, from which Lancaster's paradigm is derived.

To many researchers the fact that a theory has such a small practical application is damning. It has been argued that the first scarce resource an economist must allocate is his or her own time and that an economist who spends his or her time on trivia is ipso facto incompetent (Bowbrick, 1988). Some researchers do not agree: for instance only 1.5% of papers citing Lancaster in the last four years cited Hendler or Lucas, whose criticisms of the boundary assumptions were the only real criticism of the paradigm.

AD HOC ASSUMPTIONS

Ad hoc assumptions are ones which are added to the basic theory because the theory will not work without special restrictive assumptions (see Popper 1972, pp15-16, 30, 1976, pp 40, 42). These assumptions are not realistic, and are not to be confused

with realistic assumptions which have the effect of making a simplified theory into a situation specific model. Each ad hoc assumption limits the number of real life situations that the theory can apply to. At the same time, each new explicit assumption introduces implicit assumptions which are likely to pass unnoticed, so there is a strong possibility that a system with contradictory assumptions will be set up.

Again, Lancaster may be taken as an example, because of his rigour and his attempts to make his assumptions explicit. (In much of the other writing in this research program it is extremely difficult to work out what assumptions the author thought he or she was using at any given moment.) He appears at first sight to be arguing a general theory from a handful of assumptions. On examination, however, it is seen that he incorporates some 63 explicit assumptions in Consumer Demand (1971) and, by the most generous allowance, 40 of these are ad hoc. There are sixteen new ad hoc assumptions in Chapter 8 alone. It is assumed, for instance that:

- When one is dealing with a group of closely related goods, all other goods may be treated as equally close substitutes for this group (Lancaster 1971 pp128-9). [He uses "good" in the sense of a single product line.]
- There is a uniform distribution of income so that average income is constant over preferences and there is a rectangular distribution of preferences, with constant density taken to be unity (Lancaster 1971 p79).
- The consumption technology is linear, after ignoring invariant characteristics, and a characteristic is irrelevant if there is a linear dependence in the technology (Lancaster 1971 p142). "In many cases it will be appropriate to assume that characteristics technically related in this way are also related in the view of the consumer so that he reacts to any one the related characteristics not to each of them separately." (Lancaster 1971 p144).
- "The most heroic assumption is the uniformity assumption on the nature and distribution of preferences.... In geometric terms it implies that the transformed indifference curves in specification-quantity space are all of identical shape and are tangent to the [Product, Differentiation Curve] at the specification corresponding to the most preferred good" (Lancaster 1979 p47).

Each explicit ad hoc assumption introduces implicit assumptions and there is no

investigation of whether these are reasonable or whether they contradict each other. There are in addition many ceteris paribus assumptions, assuming for instance that everything is consumed the moment it is bought. Ceteris paribus assumptions are necessary at some stage to make a theory manageable, but they must eventually be dropped. If they are not - and Lancaster does not drop them - they are just another form of ad hoc assumption or, in some cases, boundary assumption.

In most cases there is no conceivable way in which one could determine whether the assumption applied in any real-life situation.

The number of restrictive ad hoc assumptions in Lancaster (1971, 1979) is so great that it is difficult to believe that any real life consumer, product or market fits them. This means that, however valid his basic theory may be, the theory ceases to have any possible application as more and more ad hoc assumptions are introduced. It is surprising therefore that in Variety, Equity and Efficiency (1979) he makes extraordinarily general statements on welfare including the welfare effects of international trade and political systems, all based on these restrictive assumptions.

Two-Stage Models

The basic paradigm assumes that goods give rise directly to characteristics. It is however possible to assume that the "characteristics are derived from consumption activities in which goods, singly or in combination, are the inputs" (Lancaster, 1971, p47). The two-stage model assumes that each activity is linear and requires goods in fixed proportions.

Lancaster (1971) does not give examples of this but it would appear to cover such activities as cooking a meal, where goods are processed by activities to produce characteristics which may not be in the component goods. Lancaster says:

"A meal (treated as a single good) possesses nutritional characteristics but it also possessed aesthetic characteristics, and different meals will possess these characteristics in different relative proportions. Furthermore, a dinner party, a combination of two goods, a meal and a social setting, may possess nutritional, aesthetic and perhaps intellectual characteristics different from the combination obtainable from a meal and a social

gathering consumed separately."6 (1966, p133)

"There are now three spaces: goods space, activity space and characteristics space, instead of two. We could transform the problem into activity space . . . but shall find it convenient, as before, to continue to handle it in characteristics space. The analysis is not, in fact, much more difficult than the simpler model since we need only deal with activity space and characteristics space" (1971 p48).7

The concept that a mixture of goods may produce characteristics that are not in the original goods is clear enough. No doubt the relationship between goods, activities and characteristics could be described mathematically as Lancaster suggests. However, there must be some operational way of moving from the analysis of characteristics in the paradigm case to the goods which are purchased if costs are to be calculated and budget lines drawn. Lancaster does not discuss this. One may ask for instance what function would relate the contents of market basket to all the possible meals that could be produced and their characteristics? How would this function be altered by consideration of the people one might consume the meal with, what they might talk about and the locations in which one might eat - to use Lancaster's own example? How could one possibly determine this function with regard to even a single individual? How likely is it that all individuals have an identical function as Lancaster assumes?

The assumption that all consumers see the same characteristics is even less credible when the goods are processed by some activity to produce goods than when the characteristics are contained in the goods. One's cooking, for instance, is very personal, and it is not to be expected that many people could produce identical meals from the same ingredients, much less an identical set of meals from the same market basket.8

In many cases, applying an activity to goods whose characteristics do meet Lancaster's assumptions will produce characteristics which certainly do not, like taste,

6 The implication of cannibalism appears to be unintentional. It will be noted that the "characteristics" produced in this 1966 statement do not conform with the criteria of linearity, additivity, objectivity, measurability and so on. Lancaster does not keep his strict assumptions when he gives examples.

7. This concept is dropped in the rest of his book.

8. Lancaster (1966, p135) assumes that each consumption activity, that is each good or collection of goods, including a market basket, produces only a single fixed vector of characteristics, so there is only set one set of meals that can be consumed from a given market basket.

texture, beauty and aroma.

Lancaster (1971) skips over this two stage model in two pages, while it is the basic model of Lancaster (1966). One may wonder whether this is a recognition that it is not handled satisfactorily. Ratchford (1975, p66) suggests that this is so:

"The complete model in Lancaster's original paper (1966) postulated an intermediate relation between goods and characteristics: goods are transformed into activities such as eating, swimming, transportation, which produce characteristics. This model proved difficult analytically and was abandoned in favour of the simpler framework presented here."

The effect of introducing activities to the theory is to introduce new, impossibly restrictive boundary assumptions. It is necessary that after the activity is applied, the characteristics are objective, measurable and perceived in the same way by everybody. This rules out activities like cooking, eating a meal in company, driving a car, or living in a house.

CONCLUSIONS

The use of rational man theories in marketing or marketing economics has been shown to be untenable under any of the five epistemologies discussed. Even those people who interpret Friedman (1953) as preferring unrealistic (not simplified) assumptions must accept this.

If we do not have the constraint that assumptions must be realistic, albeit simplified, an infinite number of unrealistic competing theories are equally tenable. Epistemology A uses theories whose assumptions are realistic in a particular instance. The others require that an accepted theory's predictions have been tested and shown to be accurate, either always (B and D) or in general (C and E), and B and C require in addition that the assumptions of a theory should be realistic. The theories fail under all epistemologies if it can be shown both that the assumptions are unrealistic and the predictions have not been tested.

The theories have not in fact been tested by their predictions, nor would it be practicable to do so, which invalidates both the theory and the model in terms of epistemologies D and E, and invalidates the theories but not the models in terms of epistemologies B and C.

The fact that it is not possible to observe indifference curves, etc. and so check on

the realism of the assumptions invalidates the approaches even for models, under epistemologies A, B and C.

The fundamental assumptions are quite unrealistic: it is extremely unlikely that indifference curves anything like those assumed could exist. This invalidates the theories in terms of epistemologies A, B and C.

Logical and conceptual errors are fatal under epistemologies A, B and C, and it would be difficult to defend a logically incorrect model even under D and E.

The extremely restrictive fundamental assumptions, boundary assumptions and ad hoc assumptions effectively exclude any real world situations.

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