

THE ECONOMICS OF GRADES¹

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ABSTRACT

This paper sets out the pure theory of the economics of grades.

INTRODUCTION

Much has been written on how consumers choose between goods: considerably less has been written on how they choose between qualities of a good. There is, as yet, no coherent theory of how they choose between grades, when a range of qualities is sold under one grade description - a much more difficult question, but one of far more practical importance. The theory is patchy, confused, self contradictory and inadequate for any real problem. No theory has been developed which is capable of answering such a simple question as "What happens to prices and sales when the cabbage crop is sorted into three grades?"

Grades are fundamental to any analysis of quality or brands, and I have discussed the relationship in great detail in my book *The Economics of Quality, Grades and Brands* (Bowbrick 1992). In this paper the role of grades is separated from the larger picture. This paper shows the problems that must be tackled in an analysis of grading in real markets. It does not pretend to solve all these problems and, in particular, it does not aim at exhaustive analysis of the welfare and other implications of each point made. Space does not permit it: books have been written examining trivial propositions on quality using a handful of assumptions totally removed from reality. It would, in any case, be pointless, as it is impossible to construct a complete, internally consistent model of grades which can be applied to all markets - analysis and solutions must be specific to the markets examined. The economics of grades is infinitely more complicated than traditional micro-economics, so generalization from simplified models is out of the question. I have brought together the theoretical approaches which I think are capable of being developed to solve the problems of the real world, and I have ignored others. Gaps in the theory still exist and many details remain to be worked out but it will take many years to perfect it, and in the meantime decisions must be made.

This paper covers the effect of grading on consumers' purchasing.

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It covers some aspects relevant to supply by producers and the supply and demand of distributors, but a full analysis of these, taking into account the effect on handling, procurement, storage and production costs would require considerably more space. Minimum standards, which are a key part of many grading systems, have been discussed elsewhere (Bowbrick, 1977).

GRADING

Grading implies *sorting, classification, grade labelling, and price labelling*, or some combination of these. For instance, goods may be sorted and priced but unlabelled, or they may be unsorted and unpriced but classified and labelled. The grade may be specified by characteristics which do not vary continuously, such as country of origin or variety, but generally some or all of the characteristics vary continuously, in which case the grade may be specified by the lower limit of a characteristic, by both the upper and lower limits, by the mean or by both the mean and some measure of dispersion, usually the range or tolerance. Items or packages are seldom evenly or normally distributed over the range of possible qualities: the distribution may be multi-modal and highly skewed because of production conditions, production methods, sorting strategies and sorting machinery. Nearly all theoretical analysis in the literature has been confined to a single-characteristic product with top and bottom limits set for each grade, and perfect uniformity of quality within that grade is commonly assumed.

It is common for a product to be classified or sorted on a characteristic which is not itself valued by the consumer but which is assumed to be positively related to one that is. Colour, origin, shape, uniformity and production method are often used as a surrogate for flavour e.g. brown eggs, Scotch beef, flat mushrooms, free-range eggs, organically-grown vegetables. This may be because the public are convinced that brown eggs are better or because it is possible to grade for colour but not for flavour. For most purposes we are concerned with the effect of grading on price and purchases rather than with its effect on consumers' satisfaction and welfare, so we may work as though the consumer valued the beef for its Scotchness. Sometimes, though, this will lead to error and confusion. For the purposes of this paper I am concerned with the objective characteristics used for grading, and not at all with the subjective, which I call attributes. Elsewhere I show the enormous importance of this distinction in any analysis of quality and brands (Bowbrick, 1992, 1994).

Classification implies inspecting an item and deciding what grade it falls into. The word is most often used when the product is not sorted, when, for instance, a consignment of wheat is tested and marked with its grade. By implication, every item is classified as part of the sorting process.

Theoretical analysis has usually been based on the assumption that there is a unique set of mutually exclusive grades. In most markets though, there

are parallel grading systems, with Classes I, II and III, besides Grades A, B and C or with individual producers using their own grades or brands. The grades may be reinforced by another classification e.g. "Class I English Cox" instead of "Class I apples". Overlaps are common because of tolerances or inaccurate labelling and because standards are based on lower limits instead of both upper and lower limits.

In the short run, suppliers have the options of doing full sorting, of leaving some or all of the product unsorted, or of doing partial sorting (when, for instance, it pays to sort a mixed product to Class 2, but the high wastage would make it too expensive to sort it to Class 1. They may also sort to closer tolerances than the specifications require, or sort to entirely different specifications. In the long run they may produce a higher (or lower) level of quality with the same dispersion, or produce the same level of quality with a different dispersion. It is unlikely that it would be possible to increase the supply of one grade without altering the supply of adjacent grades.

GRADES AND THE ECONOMICS OF INFORMATION

This section considers grades in the light of the paradigm "The Economics of Information." In the past, theoretical analysis has treated grading as an aspect of the economics of consumption under perfect competition and has ignored information while consumerist legislation has treated grading largely as a method of conveying the maximum possible amount of information so that the consumer can buy on description with confidence. Neither approach is satisfactory. It is often satisfactory to treat a grading problem entirely as a communications problem, and for this reason this section will ignore complicating factors discussed below - type of good, type of characteristic, uniformity of characteristic and product, multi-characteristic products, bulk goods and minimum standards. For the moment it is assumed that the product quality is vertical (that all consumers would rank items in the same order if prices were the same); that quality characteristics used for grading are relevant to the consumer; that there is a single set of mutually exclusive grades that any item of a given quality can only go into one grade; and that the consumers' perception of the quality of an item is not altered by the fact that it is labelled Grade A rather than Grade B.

The economics of information

The basic premise of information economics is that a cost is incurred in acquiring the information necessary to make the optimum choice, so it pays the consumer to seek a satisfactory rather than an optimum purchase and to stop searching for a better purchase when the probable marginal benefit from a further search is equal

to or less than its cost (Abbott, 1955; Stigler, 1961). The amount of searching worthwhile at any moment depends on what the buyer has already found out (Nelson, 1970; Rothschild, 1973). Often the consumers do not know the distribution of price or quality or of the price:quality ratio, so they do not know the exact probability of finding a better item after a further search. Analysis based on these premises is illuminating, though it does not allow for the irrational, emotional and random elements in purchasing behaviour.

What information grades can carry

Information can be conveyed by grade labelling, by price labelling or even by sorting. The quantity of information that is offered can vary enormously: for example

- a) the product may not be labelled at all
- b) only the price may be marked
- c) the grade label may indicate no more than that the product has been sorted or classified according to some unstated specifications
- d) the grade label may indicate the ranking of the grades
- e) some at least of the customers may have an idea of the specifications of the grades
- f) the exact specifications in some or all relevant characteristics may be marked
- g) the seller may label the better grades but may leave the cheaper grades unlabelled.

The quantity of information given on the label does not indicate the quantity of information used by the consumer, or its importance. It is very seldom, for example, that the full information of an American food label is used. Hanson's (1980) study of the number of bits of information that a grading system can communicate is relevant.

Grades are usually thought of as a method of giving more information to purchasers. In fact the opposite is the case: they reduce the amount of information that they need to make a decision, so reducing search. Alternatively, they let them make a better choice with the same number of bits of information. They can make the best possible purchase without inspecting and evaluating all available items. Even information on the level or ranking of grades may be enough for them to rule out most grades and confine their inspection to one or two (here the benefits from labelling a given grade go mainly to those who avoid it). They can make considerable savings in search even from the knowledge that Grade B in one shop is similar to Grade B in another, or that "Select" is not the same as "Choice." Savings in search may arise from the fact that the product has been sorted to some relevant specifications even if the buyers do not know that this has been done, but further, complementary, savings arise from the

information that it has been sorted, even if the specifications are unknown. (The effect of uniformity on search is discussed below.)

The buyers may accept lower probable quality in exchange for much lower search costs: they may pick a random item from the chosen grade, knowing that it will be acceptable, rather than inspect all the items in the grade and get the optimum purchase.

Sales on description

When constructing theoretical models it is convenient to assume that consumers buy on description, judging the quality by the grade label alone. However, sales purely on description or nearly so are limited to a few commodity markets, so these models are of very limited application (if indeed their assumptions are compatible with these markets). Nearly always the grade is only one of many factors which the consumer takes into account, and it is often ignored in favour of other factors.

Information may be obtained by an inspection of the goods. Often, as with fruit and vegetables at retail, a cursory glance gives the consumer as much information as the grade label could and grades are ignored. With other goods, inspection may only be used to choose individual items after the optimum grade has been identified. Market research finds that buyers use a range of cues such as the brand name, the price, and the location, reputation and quality of the store as indicators of the quality of a product. Information is also obtained from consumer journals, from the trade press or from friends. This implies that a grade should be designed to complement other cues and the buyer's inspection, not to substitute for them by trying to describe all quality characteristics in the words "Grade B." For example it is possible to give accurate and useful information by size grades where a ranking by "quality" is likely to give only very crude information which adds nothing to the information obtained from other cues. All too often it has been assumed that a grading system should be designed to provide a complete description of a product, to be some weighted average of all the characteristics the average consumer might possibly want to take into account.

If a good is sold purely on description, with the buyer knowing only the price and the grade and having no other quality cues, then the grade label is the only indicator of quality in all its aspects. Three or four grades are of very limited value as a description unless there are only a few, closely correlated, characteristics of interest. If the label is to have any real descriptive power or to permit any segmentation, especially with horizontal characteristics, there must be a large number of grades or separate classification by several characteristics (e.g. one for size, one for colour, one for shape). Those commodities successfully traded on description tend to have hundreds or even thousands of grades. Similar difficulties arise when the grade is used for price reporting.

The rational and cynical buyer will use grades with caution unless he believes that it is not in the seller's interest to cheat. He may believe that the seller who mislabels will be prosecuted and will lose repeat customers;

that the seller who uses a misleading grade name - his own "Grade A" for what most people would term "Class III" perhaps - will lose customers and will have to take an unduly low price in future; that the seller whose grade standards fluctuate will in the long run get a lower average price. Clearly, the sanction must be greater than the profit from the deception if it is to be effective in an amoral world. Dishonest traders do not just cheat their customers; they make it less safe for anyone to buy on description - this explains the draconian sentences on forgers. If, however, sanctions are too great in relation to benefits from grading producers will underestimate quality, so there will be more incentive to search. The understatement may become traditional, as with the baker's dozen. Sellers can reduce search cost and so, in effect, price, by providing guarantees. This implies transmission of risk from buyer to seller, but both guarantees and improved transmission of information may increase total risk (Spence 1976). No models of risk transmission in grading have been constructed.

When a good is sold purely on description and the seller knows more about its quality than the buyer does, the market can break down. Akerlof's (1970) model of the second-hand car market shows that if someone buys a new car that turns out to be a lemon, it pays them to sell it on description, by year and model, and to buy a car of the same description, knowing that it cannot be worse and it may be better. Potential purchasers, realizing this, offer a lower price to allow for the increased chance that a second-hand car is a lemon, which the owner is trying to get rid of. The owners of good cars will not sell at this price, so the proportion of lemons on offer rises and the grade price falls still further. The situation may arise where no trade takes place, even though there are many prices at which some people want to buy and others to sell. This is not because of risk alone - there is a thriving trade in new cars in spite of the risk of buying a lemon - but because the sellers know more than the buyers. The model assumes a reservation demand and a description based on a characteristic, second handedness, which is a surrogate for quality. It would be informative to build search into this model.³

A seller with an above-average quality of product (a Grade B that is nearly Grade A) will offer it for inspection, brand it, guarantee it or assure regular customers that it is above average: anything rather than sell it on description by grade. When many sellers do this, the probable quality of anything sold on description falls towards the lowest quality in the grade and the price falls accordingly. This has been observed in the U.S. beef market. In order to reduce the problem of buyers selecting the best from each grade and leaving the rest, Zimbabwe introduced 5000 grades of Virginia tobacco, each relatively uniform. Now that they have switched to auction markets, the grade has a different function, price reporting, and only 2000 grades are used.

Contrary to popular wisdom, it is not necessary that a grading

³ This model is in fact based on a large number of assumptions that are unlikely to apply in any real market, so it is not surprising that attempts to apply 'lemon legislation' have failed. See Bowbrick 1994

system should be used by everyone: in fact it is unlikely to be effective for buying on description unless some people ignore it. When most of the customers in the market are well informed, the grade prices (and sometimes the prices of items within a grade) reflect the demand and what customers consider to be acceptable value for money. An individual may then, quite rationally, judge quality by price, instead of inspecting the alternatives. Indeed, he may feel that, as he is a typical consumer, all grades and all items within grades offer him equal value for money and he can make a random choice. However, the more customers that act in this way, the less reliable price will be as a cue. A substantial proportion of customers must search if price is to reflect quality (Grossman and Stiglitz, 1976). The necessary amount of search will be high when a grade is introduced, low when it is established and higher when the price:quality relationship has broken down. The astute buyer may work out where his tastes differ from those of the average buyer and adopt an appropriate strategy, always buying the cheapest for instance. Salop (1977) points out that cynical consumers or those who have read Akerlof (1970) will inspect and will drop out of the market rather than buy on description. As long as their preferences are typical, their inspection helps keep the market price:quality relationship relevant for the others.

The rational consumer, faced with a list of unfamiliar wines in a tourist hotel with no repeat customers, will choose a grade, like Qualitätswein, then choose the cheapest wine in that grade, on the grounds that there is asymmetric information and there are no sanctions against the unscrupulous seller. Some customers assume, for no particular reason, that the goods with the highest price are the best. Not surprisingly, they are often deceived: over a wide range of goods, the most expensive or the most advertised are inferior (see Morris and Bronson, 1969; Gilligan and Holmes, 1979).

The implications are serious. It has been shown above that sales purely on description by grade are very rare. It has also been shown that buying purely on description is not likely to be efficient and can lead to serious distortions of the market. Yet most grading systems are designed for sales purely on description: it follows that they are usually partly or wholly irrelevant.

Search goods and experience goods

The use which consumers will make of grades and other quality cues will depend on whether the good is a search good, one that the consumer examines and appraises before selecting, or an experience good, one that he buys and appraises by consuming. Theory suggests that it is a better strategy for a buyer to treat a good as a search good if the information is cheap or if the cost of making a wrong choice is high (e.g. Nelson, 1970). Expensive goods, goods that account for a high proportion of the consumer's expenditure, goods with a high proportion of substandard items and variable goods are likely to be search goods. Goods for which the cost of evaluation is high relative to the cost of making a sub-optimal decision, goods that are difficult or expensive to inspect, cheap goods, goods that are unlikely to be sub-standard, and goods for which a guarantee reduces risk are

likely to be experience goods.

Most goods are not pure search goods or pure experience goods. Habitual purchase strategies are the norm. Typically consumers adopt a habitual purchase strategy after comparison shopping, deciding to buy Grade X, but to make purchases of other grades from time to time to see if the strategy is still sound. In the search period they adopt a search pattern that would be uneconomic in the long term; they search more thoroughly and try less likely grades and shops (Nelson, 1970). In their habitual purchase pattern they only occasionally make such searches and the good may appear to be an experience good. This explains why market research conducted in the initial search period may be a poor predictor of long term purchases. It also explains why consumers request detailed information such as vitamin content, when many studies (e.g. Lenahan et.al., 1972; McCulloch and Padberg, 1971) show that they seldom use it - it may be valuable in the initial search period and for check purchases, but not otherwise. Some consumers find any search, and any uncertainty, unacceptable, and prefer to buy the same grade each time, even if it is far from the best buy.

Clearly the grade performs a different function with each type of good. A grade for a search good may speed up the search for the optimum item, saving the consumer the trouble of examining obviously unsuitable items. A grade label for an experience good may indicate only that the product is not obviously unsuitable, so further search is unnecessary. In fact it may give the purchaser just sufficient extra confidence to turn a search good into an experience good. A grade for a habitual purchase identifies goods as being of a quality not dissimilar to that of a previous purchase, satisfactory or not - it is only for habitual purchases that it performs a similar function to a brand label. Grade standards that fluctuate randomly over time may be quite adequate for search goods or even experience goods but are of little use for habitual purchases, though standards that fall during scarcity, so that Grade A means only the best of what is available, could be of some value especially where, as is often the case quality is related to yield.

The seller can change a good from a search good to an experience good or to a habitual purchase by providing more information or a guarantee, and grades could be designed with this in mind.

Grades may be used as a marketing instrument by buyers as well as sellers (notably by industrial or agribusiness purchasers), increasing effective price to the seller or reducing their own procurement costs by reducing search. Initially buyers or sellers may try several prices or specifications in order to find out more about the demand and supply function before settling on the combination that will maximize profits. Analysis of the reaction between buyers and sellers by game theory would be too complex to be of practical value.

Availability

For many products, the retailer stocks only a single grade or else two grades which are not close substitutes, like small, prepacked apples and large, loose

apples. This reduces procurement and handling costs and floor and shelf space requirements. Once the customers have entered the shop they can search for the best of the grade on offer, but they must leave the shop if they want to see other grades or to compare prices. They face the risk that the offer will no longer be available if they return after investigating alternative offers; they may even know that it will not be available, as in the Telser (1973) model. If the product on offer is near the bottom of the grade and they believe the grade price to be constant from shop to shop they will be more likely to buy elsewhere. Brands usually offer the buyer the implicit assurance that prices as well as quality will be much the same elsewhere; hence resale price maintenance reduces search. With grades there is less such assurance.

If the customers are not satisfied with the price and quality, they may buy a smaller quantity than they had intended or they may buy other goods instead; they may postpone their purchase in the hope that they will get a better bargain elsewhere or next time they visit the same shop. Their decision will be influenced by the amount of the good they have at home (Abbott, 1955; Handler, 1975; Carlton, 1977).

The customers are clearly worse off if they have less freedom of choice even if the one grade on offer happens to be their preferred grade (Southey, 1975), but the reduction in search cost may offset this.

Once a customer has entered a shop, that shop has a certain locational monopoly for a range of goods including ones that did not influence his decision to enter that particular shop. The shop may exploit this locational monopoly by restricting choice and so reducing costs, rather than by increasing prices. To a very large extent the modern supermarket customer is choosing shops rather than choosing grades of individual products. For this reason department stores and supermarkets try to build up a reputation for quality, for price ("We are never knowingly undersold") or for supplying a combination of price and quality that will be acceptable to a certain socio-economic group (compare Harrods, Marks and Spencer and Woolworth's).

Nelson (1970) expects that a store selling search goods will carry more brands and that such stores will cluster together to make search easier. His argument is based on a shop selling several brands of one product. Sales of vegetables by greengrocers and market stalls follow this pattern, but when the customer once enters the supermarket for their weekly shopping expedition, vegetables become an experience good.

It is common for there to be legislation preventing people from grading to any specifications other than the legal grade specifications. Occasionally any sorting is forbidden: for example, to get the maximum quantity of calories out of wheat, it is forbidden to sift out white flour from the whole-meal in wartime; to facilitate price control it is sometimes made illegal to sell different cuts of meat at different prices

Method of sale

The method of sale has a considerable effect on the amount of information transmitted and on the quantity and type of information required. The method of sale usually assumed for analysis is one of buying on description with zero search cost. Some methods which are far more common in reality are listed below.

A product is sorted and labelled with its grade. The customer can instantly evaluate the produce and select the best items. They have full freedom of choice and can make the optimum choice. The sorting may reduce their search but the information has no effect. The fact that, in these circumstances, Class 1 gets a higher price than Class 2 often misleads the unwary into supposing that the sorting or labelling is responsible for the difference. Possibly all that has been done is to recognize an existing situation, and demand and supply remain unchanged.

A product is sorted and labelled and each item is priced separately according to one or more quality characteristics (not necessarily the same characteristics as are used for classification into grades). Here most buyers might make a random choice in the belief that there was no great difference in the value for money throughout the grade.

A product is sorted and labelled with its grade, and there is a single price for all the items in each grade. This price is low enough to clear the lowest quality items in the grade or, alternatively, the retailer must downgrade or discard some items. (It must be emphasized that the grade price which just clears all items is not necessarily the price that would be charged for the worst item in the grade with individual pricing.) The first customers to visit the shop can select the best items in the grade and pay the price charged for the worst, and they will normally buy more as a result. It will pay them to search. The last customers are offered only the worst of the grade, but since the quantity on offer has been reduced by increased sales to early customers, and since the items are uniform, reducing search, the mean price may be higher than with individual pricing. The early customers and those who search most may have atypical demands. There may be a switch in demand from one grade to another. A customer may prefer Class 2 when the biggest Class 1 are 79 mm in diameter and the biggest Class 2 are 59 mm but he may prefer Class 1 when the biggest have been sold and the ratio falls to 60:40. He may have the choice of the best available in four or five grades. Which is the better buy 10 items from the middle of Class 1 at £2 or 12 items from the top of Class 2 at £1.80? When only one grade is available in a shop his decision on whether to shop elsewhere will be influenced by the quality of the Class 2 in the shop he is in as well as the expected quality elsewhere. Many retailers refill their display every time half is sold, and, as the better items are sold first, the average quality on offer falls. If Class 1 can include some Class 3 items, the retailer can end up with a Class 3 display from a Class 1 consignment. Eventually he must cut the price or throw away everything on display. This is common with supermarket fruit displays. Because of this, and because retailers may feel that they are paying for a consignment at a price related to the average

item in the grade and are charging a price related to the minimum (which could be true) and because they think that customers undervalue a product when the quality on offer varies, they frequently insist on buying a product sorted to much closer tolerances than those laid down by statute.

Where differences in quality are small and the habitual purchaser thinks that his good and bad buys will cancel out, very little inspection may be done. Grade pricing is not necessarily less efficient in extracting consumer surplus than individual pricing is and even if it were, savings in the sellers' time would usually compensate. Products sold at a grade price tend not to be those sold priced item by item, so direct comparison is difficult.

Some sellers start by selling a grade at one price, then reduce the price when the better items have been sold. Fluctuating grade prices are commonly tied in with some form of intertemporal price discrimination, as when a hardback edition is followed by a cheaper paperback edition (Baron and Peterson, 1978; Gately, 1976; Lofgren, 1971). Again, the customer who buys Class 2 at the original price may buy Class 1 at the new price, or vice versa.

Goods sorted into packages will be discussed under "uniformity". Consumers can search for the package with the highest average level of characteristic and the greatest uniformity but they no longer have the option of selecting the optimum purchase. The number of very uniform purchases possible will be far lower than when the consumers inspect each item before purchase, though, in practice, efficient sorting machinery usually produces such a uniform package that it would not pay them to select item by item from a bulk display instead. Increments in purchases are more markedly discontinuous with packages, and it is more likely that grade prices will be charged than a price per item. Another whole package must be bought rather than just another item. Individual or products sold in packages tend not to be same as those sold item by item so comparison of the two selling methods is difficult. Sometimes, in fact, large apples are sold loose, item by item, while small apples are sold in bags.

The customers may inspect the product on offer but be compelled to take a random selection or what the seller selects. Their valuation of a possible purchase is then based on the expected level of characteristic and the risk.

Brands

Brands are used by single firms, while an effective grade is nearly always established by government action or by explicit collusion by a group of producers. If either a grade or a brand is to be effective, consumers must recognise it and trust it. Most attempts at establishing a brand or grade image fail: it is not enough to put a grade or brand label on the side of a box. Typically one needs market segmentation, quality control, contingent sanctions, advertising, regular customers, and a substantial market share to establish an image. An established brand or grade permits habitual purchases and so reduces search and effective price, which makes it difficult for new brands or new grades to penetrate the market, and for brands and grades to exist side by side. A grocery brand leader

can get a premium price without losing market share. With grades, any new seller can use the established grades and this increases competition, but the difficulty in introducing alternative grading or branding systems seriously hampers market segmentation, innovation, promotion and advertising. With agricultural products in particular, the supply of goods of each quality from each producer fluctuates over time. This makes it difficult for a producer to establish a brand image as he cannot guarantee continuity of supply of a brand with fixed specifications. This is one reason why grades rather than brands are used for most agricultural products.

Price Reporting

Grades may have an information content that is valued by the consumer and yet may not affect the consumer's transactions. One example is the market where everything is bought on inspection, but the grade and price are recorded after the transactions for price reporting. Sheth (1999) considers that information from advertising may be more important in satisfying people's disinterested curiosity about what is going on, in reminding them when to buy a product for which they have a habitual purchase strategy and in reinforcing past choices as a rationalisation process, than for evaluation and choice. The information required for price reporting and the other purposes is not necessarily the same as that required for product evaluation. In fact price reports may be used for many purposes: by the seller who wants to know what is a reasonable price to accept, by the producer who wants to know the optimum sorting strategy, by the distributor who wants to know how to segment the market, by the supplier deciding what quality to produce in the long run, by the supplier deciding whether to sell now or later, by the buyer assessing his skill or by the buyer communicating his wants to the sellers. They may be used to facilitate futures trading. They may facilitate bureaucratic manipulation of the market, as with EEC intervention and levies. They may satisfy the curiosity of economists and statisticians. The optimum grading system for each of these purposes is likely to be different. The relevant specifications may not even cover the same characteristics as would a normal grading system. It is unlikely that any grading system will be useful for several types of price reporting as well as for product evaluation in the shop and the market. A system that does only one or two jobs but does them well is likely to be the most satisfactory.

Different grading systems will be appropriate at different levels of the marketing chain. For example, in the United States the grading system for cattle ex farm is designed to help the fattener get a uniform pen of steers, and so reduce feeding costs. The side of beef is then classified twice, first to indicate the "cutability" – the percentage of expensive cuts the butcher will get - and second to indicate the palatability which is all that interests the eventual consumer.

Elsewhere I have shown that few price reporting systems produce meaningful information, and that grades and quality are only one reason for this (Bowbrick, 1988)

Grades as information

It has been shown above that the traditional economics of quality, which ignores information, is inadequate: an analysis of a grading system in the light of the economics of information is essential; often this alone shows a system to be ridiculous.

Most of the valid objectives of a grading system are to do with information and should be carefully defined within the protocol for the system to avoid the common confusions of objectives. Many of the objectives are likely to be conflicting in practice. It will be rare that a grading system is capable of achieving several aims.

Buying a search good purely on description is rare. Analysis based on the assumption that people do buy on description is irrelevant except for a handful of markets, notably commodity markets. Grading systems designed on this assumption are generally useless or positively harmful.

From this point the discussion will be on those aspects of grading that do not necessarily bear on information.

EFFECT OF A CHANGE IN GRADE SPECIFICATIONS

Any change in grading specifications changes all supply and demand functions for the product, for the grades and for individual items (unless, of course, both the old and the new grading specifications are irrelevant). One cannot use ex ante data, however complete, to describe what will be the effect of introducing a grading system throughout a market: any prediction will be a guess. Still less can one predict the effect of introducing grading systems for several competing products simultaneously.

Any change in specifications that results in a different quantity being put into a grade changes the supply and demand function of the firm and the individual. If, for instance, a product is bought entirely on description and the borderline is shifted so that more items go into Class 2 and less into Class 1, then in the market period :

1. There is more Class 2 and its price will tend to fall.
2. The average quality of Class 2 will rise and so its price will tend to rise.
3. Some people who would have been satisfied with the poorer Class 1 will now buy Class 2, raising the demand for Class 2 and lowering that for Class 1.
4. The amount of Class 1 will fall so price will tend to rise.
5. The quality of Class 1 will rise so price will tend to rise.
6. Classes 1 and 2 will become closer or less close substitutes so the cross elasticity will change.
7. The ratio of prices between the two grades will change and this will change the cross elasticity between the two at the margin.

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8. Class 1 and Class 2 will become closer or less close substitutes for other goods and the cross elasticity will change.
 9. The ratio between the prices of Class 1 and 2 and the prices of alternative goods will change and this will change the cross elasticity at the margin.
 10. The changed quality may make Class 2 more or less suitable for some uses.
 11. The search cost or risk falls for Class 1 as it is more closely defined, but rises for Class 2.
 12. Some items are considered to be worse just because they are now labelled as Class 2 (an effect that is emphasised when each shop sells only one grade).
 13. The quantity of waste may change.
 14. Production and handling costs may change.

The overall effect may be an increase or a decrease in the price paid or the total revenue. The effect is greatest when the good is being bought on description. This is an extremely simple example as changes normally involve changes in several limits or in the number of grades. There could also be a change in the sorting strategy, with more going into the top and bottom grades and less into the mixed grade. More precise sorting can reduce tolerances or use a new technology to exploit the fact that tolerances are wider than necessary (Conniffe, 1976). A change in production processes changes the proportion in each grade. Labelling may change. It is impossible to predict the price effects of these changes as there is literally an infinite number of possible grading systems for a single good.

The optimum production, sorting and labelling strategy of the individual producer selling in a perfect or imperfect market is beyond the scope of this paper. However this too would alter supply and prices, especially in the medium and long term.

SEGMENTATION

One of the main benefits expected from grading is *market segmentation*, where it is accepted that the demand for quality is not the same in each segment of the market, and production, sorting and distribution are changed so the product going to each segment matches the demand (Smith, 1956). With the closely related technique of *product differentiation* each producer has a different good, which he brands and advertises to bring a convergence of demand onto the good, and so reduce cross elasticity. Elsewhere (Bowbrick, 1992), I develop a much richer concept, that of *product variation*, a concept which was first introduced by Chamberlin (1953).

Segmentation may be achieved by sorting the product so that each

grade meets the needs of one segment of the market. Vertical segmentation exists when everyone agrees that one grade is better than another but some choose to buy the cheaper grade. Horizontal segmentation separates out and identifies grades that are not better or worse but different, due to differences in end use or in consumer tastes e.g. red and green apples. The location of grade boundaries is critical. Abbott (1955) and Kuehn and Day (1962) use variants of the Hotelling (1929) model to analyse the optimum number and position of new products, homogeneous in quality, along the quality spectrum. It is obvious that, if production, search and distribution costs are ignored, the more grades there are the more likely it is that each customer will be able to make the purchase that is optimal and welfare and sales will be maximized. (Formal proofs of similar propositions are presented in Abbott (1955), Freebairn (1967), Lancaster (1975) and Zusman (1967).) As the number of grades increases, the marginal increase in welfare from adding a further grade falls, especially if search is taken into account. The optimum number and location of grades is not easily determined, especially if the effect of the number of grades on production and distribution costs is taken into account.

As well as increasing effective demand in this way, segmentation can earn monopoly profits, for example by changing the boundary to reduce the supply of a Class I with an inelastic demand and to increase that of other classes. This is most likely to be done by a national marketing board, which can enforce standards, and can adopt a strategy that benefits the industry as a whole, though not necessarily all sellers. In the long run, changes in production, and the introduction of brands, advertising and alternative market channels will erode this monopoly profit. Supply control is needed to make monopoly profits from segmentation in the long run (though conceivably some profits could be made if the segmentation changed in each market period according to fluctuations in supply and demand.) A firm may advertise to and supply only one segment, reducing the costs and increasing the effectiveness of the advertising. Supermarkets stock qualities appealing to several segments, because they sell to a wider range of customers than most retailers do, and because they do not have counter assistants who can persuade a customer that the quality in stock is, in fact, the one best suited to the customer's needs. Increasing affluence also leads to more demand for variety (new goods, more goods or more variety within a good). It appears to be more difficult to segment when the market is small, is dominated by heavy users or has a dominant brand (Young, Ott and Feigin, 1978). The use of segmentation by buyers is important in agribusiness.

Techniques to identify those customers who have similar demand functions and can be thought of as a segment of the market have not been widely successful because they are too refined for the data (Michman, Gable and Gross, 1977; Wind, 1978) and because researchers have "failed to analyse the marketing environment before applying their favourite methodological approach" (Young, Ott and Feigin, 1978). In practice, research identifies segments by factors like the age, income and family size of customers with certain preferences, which makes

calculation of the true elasticities difficult and hides the existence of segments which are not related to these socio-economic indicators and of segments arising from the fact that all consumers usually prefer Grade X but sometimes prefer Grade Y.

CHARACTERISTICS

In theoretical models of grading it is usually assumed, accidentally and unwittingly, that before grades are introduced there is a single, continuous quality characteristic and that the goods are evenly distributed between the different levels of quality. Once grades are introduced there is a step function with each grade being perfectly uniform, with a level of characteristic half way through the grade.

This can happen with certain bulk goods (see below) but other types of quality characteristic are more common in the real world. Some characteristics are dichotomous - red or not red. A not uncommon problem is similar to whether two colours of apples or two grades of grapefruit should be separated or sold as a mixed consignment, allowing for the fall in price of the less popular grade when separated as well as the rise in price of the more popular.

Some goods have characteristics that are technological substitutes. One can substitute two items with a low level of characteristic for one with a higher level to produce the same result. Two bags of 21% P fertilizer may be substituted for one of 42% P. It is not implied that the value to the user is identical - with the fertilizer, for instance, the application cost must be taken into account. The rate of substitution cannot be expected to be identical over all ranges of intensity. Many examples of technological substitution arise with industrial raw materials but only a few spring to mind with regard to household purchases, and those that do tend to be raw materials for cooking: for instance after trimming, 1.5 kg of low grade Brussels sprouts produce the same quantity of edible sprouts as 1 kg of high grade sprouts.

More common than technological substitution is the familiar economic substitution. If one buys two items of good X rather than one item of good Y, or two of quality M rather than one of quality N, one gets a different satisfaction but one may feel oneself better off. The two satisfactions are qualitatively different and cannot be equated objectively. Often, indeed, the satisfactions from two items with different levels of characteristic are no more closely related than the satisfactions from two different goods e.g. no quantity of rubbing alcohol gives the same pleasure as old brandy, no quantity of size five shoes gives the same goodness of fit as a pair of size ten shoes. The problems of dealing with such goods are familiar.

At times a problem may be clarified by expressing a characteristic in terms of the satisfactions produced rather than its physical measurements.

Defining shoe size by “goodness of fit” converts a horizontal characteristic into a vertical one, as far as the individual consumer is concerned. There is a danger though that one will get lost in abstractions once one leaves objectively quantifiable characteristics.

It is convenient to assume that buyers’ satisfaction is positively related to level of characteristic and that quality is vertical. In fact most goods have some negative characteristics, many positive characteristics are perceived as negative over some ranges, and many are perceived differently by different customers. Some of the economic models of grading deal with a good, like mincemeat, where the level of characteristic A, percentage meat, is related to the proportion of characteristic B, percentage fat. Goods like this are not common. Theoretical analysis often makes use of indifference curves, using quantity of characteristic A on one axis and quantity of characteristic B on the other (e.g. Lancaster, 1979). It is assumed that the shape of these indifference curves will be similar to that assumed for normal indifference curves. A little examination shows that this is not correct. Consider, for example, an electrical device with two perfectly reliable fuses: the consumer is indifferent between any goods with a given level of sensitivity of fuse A, as long as fuse B has greater sensitivity; the indifference curves are therefore parallel to the axis. Consider, too, a mixture of gin and whisky: the consumer may be indifferent between pure gin and pure whisky but may find the mixture revolting; the indifference curve is then concave to the origin. It is forgotten, first, that the shape of normal indifference curves is just a convenient assumption, and second that the analysis that is appropriate when the axes are quantities of two different goods is not at all the same as that when the axes indicate the level of characteristics A and B for unit quantity of a good. It should not be thought that the shape of the curve most suitable for mathematical analysis is necessarily the norm or even that it is common. A little thought about reality should precede model building.

Elsewhere (Bowbrick, 1992, 1994) I show that most of the curves used in the literature are incorrect. I also show that Lancaster’s work is incorrect in many ways, including this.

UNIFORMITY

It is often said that increased uniformity is a Good Thing and that this justifies grading. In fact, four types of benefit from uniformity can be distinguished: reductions in distribution costs and in production coats (which are not covered in this paper), increased satisfaction to the consumer, and reduced search.

People frequently prefer a uniformly mediocre package to a better, less uniform, package, because it is more attractive or more useful. They may value it according to its geometric mean rather than its arithmetic mean. Lack of uniformity is sometimes valued, as with salads, clothes etc. Black Magic

chocolates are valued for the lack of uniformity within boxes, while the uniformity between boxes and over time reduces search cost. Uniformity may be totally irrelevant, as when the product is valued according to the lowest level of characteristic within a grade or to the average level within the grade. Most formal models assume, accidentally and unwittingly, that uniformity is irrelevant. It is often assumed for instance that an item gives the same satisfaction whether it is bought in a sorted or unsorted lot, that the satisfaction given can be added, or that the satisfaction from a characteristic is the same whether it is purchased as part of a pound of ham or as part of a pound of beef. Handler's (1975) criticisms of Lancaster (1971, 1975) are relevant. Uniformity within a purchase, uniformity within a package and, to a smaller extent, uniformity over time, affect consumers' satisfaction. Search is affected most by uniformity over time, the uniformity of the items, packages or bulk goods on offer, uniformity within packages, uniformity between sellers, and uniformity of specifications between locations and over time.

With a single-characteristic product, uniformity may be defined in terms of standard deviation, range or tolerance, though many specifications which require uniformity do not define it. Frequently, uniformity and tolerances are thought to be independent. Sometimes it is stated, not necessarily inadvertently, that a package that is half Class I and half Class II is not uniform and must be marked down to Class III. With a multi-characteristic product, uniformity is not as easily defined and few specifications make it clear whether each of, say, six characteristics must meet certain uniformity criteria or whether the data on all items must be combined in some way to give a measure of uniformity for the product as a whole. A point nearly always overlooked is that uniformity at consumer level and at wholesale level must be defined differently because the range and the distribution of standard deviations are related to size of sample. If, for instance 10% tolerance is permitted, a box of apples may have 10% out of grade: when packs of nine apples are made up from the contents, any pack containing a single out-of-grade apple exceeds the tolerances and between 11% and 89% of the packs will be out of grade, even when the box meets the specifications. The subjective evaluation of uniformity need have little relation to any statistical measure. The appropriate measure of uniformity depends on whether the uniformity is intended to cut costs, cut search or increase satisfaction.

The specifications or sorting methods can affect uniformity in ways not usually foreseen. Consider, for example, a good whose constituent items are distributed uniformly along the level-of-characteristic axis. If the product is sorted into packages (or consignments) so that every item in the package meets the category specifications, there is, in effect, a sample from the population of all items in the grade, and the mean level of characteristic of the items in the package will be distributed as in Figure 1. Packages with a mean level of characteristic near the top or bottom of the grade will necessarily be uniform and will be uncommon. Some goods are sorted into packages and are then classified according to average level of characteristic, in which case the mean is distributed

as in Figure 2. If uniformity is valued, customers will be willing to search for a uniform Class 2 which they prefer to a mixed Class 1 and which is cheaper (price is generally related to mean level of characteristic and not uniformity). The distribution clearly determines optimum search strategies.

Bulk Goods

Bulk goods are those that, like liquids or powders, are not sold item by item but by weight or volume. They are likely to differ from the goods discussed elsewhere in this paper in one or more of the following ways:

1. There are small increments in quantity, as with petrol or electricity.
2. The product within a purchase is perceived as homogeneous or uniform.
3. Anything between 0% and 100% could be out of grade, while a pack of four apples could only be 0%, 25%, 50%, 75% or 100% out of grade. As the number of items in the pack increases, the product becomes more like a bulk good.
4. It is impractical to select a superior sample by selecting one item
5. at a time.
6. The product is classified but not sorted: e.g. grain, milk.
7. Different qualities may be blended, but they cannot be separated later: e.g. whisky.
8. It is expected that any purchase from the bulk will be identical.

Economic models frequently assume that any purchase of Grade X is identical, and that quality increases in steps from one grade to the next, instead of there being a range of qualities within a grade. This would only be valid with single consignments of certain bulk goods.

MULTI CHARACTERISTIC PRODUCTS

Most products have several important characteristics and, even when (by assumption) there is only one relevant characteristic, the consumer may take into account uniformity and several quality cues. The buyer must evaluate items before purchase, using some weighting system, for the characteristics and cues. The consumer will experience and appraise the product as he eats it, again weighting characteristics. The only buyers to use mathematical analysis to choose the optimum purchase are a few manufacturers buying industrial raw materials. For most of us, and for most decisions, there is a substantial random or other irrational element. Decisions are sequential. We value variety over time. In purchasing, and even more in consuming, we do not value a good as being "simply a transfer mechanism whereby characteristics are bundled up into packages at the manufacturing end, pass through the distribution and marketing processes as packages, and are then, so to speak, opened up to yield their

characteristics again at the point of consumption." (Lancaster, 1979) We value a picture as a picture, not as a mixture of characteristics.

Certain standardized purchasing strategies have been formulated, which are not optimizing and which could be used by a rational buyer trying to reduce search. While they are unrealistic, they are illuminating. The commonest such purchasing strategies are described by Wright (1975). They comprise a selection rule and an evaluation process. One can select the best (BEST), comparing one item with another until one is clearly the best, or select all items with quality above a certain cut-off point (ALL) or all until ones requirements are satisfied (FIRST).

First, though, the items must be evaluated. With compensatory evaluation, low values of one characteristic compensate for high values of another, as with averaging (AVG). The weighting depends on the relative importance of the characteristics, their reliability etc. Any of the rules ALL, BEST, or FIRST may be used with AVG. With other processes, high values of one characteristic do not compensate for low levels of another and the product is evaluated on one characteristic at a time. With the lexicographic (LEX) process, the buyer places the characteristics in order of importance and evaluates the items on the most important characteristic, and uses the BEST rule; if he gets no clear-cut answer, he switches to the next characteristic. This process is, as its name suggests, the method of placing a word in a dictionary on the alphabetic order of each letter in turn. The MINIMAX strategy, which also uses the BEST rule, compares the alternatives on their worst characteristics, rejecting those items with the lowest levels of characteristic and those with the most characteristic at low levels. The consumer does not mind if his purchase is not the best possible, as long as it minimizes the possibility of absolute disaster. The MAXIMAX strategy makes use of the BEST rule, with the purchaser selecting the ones with the highest levels of their best characteristics. The other strategies do not use the BEST rule. The conjunctive strategy (CON) sets cut-off points for some characteristics and the item is rejected if it is below the limit for any characteristic. The disjunctive strategy (DISJ) accepts the item if it is above the limit for any characteristic (see also Wilkie and Pessemier, 1973). A sequential elimination procedure (SEQ-ELIM) uses cut-offs in the same way as CONJ or DISJ, applying them to each characteristic in turn until the required number have been selected (FIRST) or all characteristics have been tested (ALL). Any of the strategies may be used sequentially or in combination with each other.

- 86 -

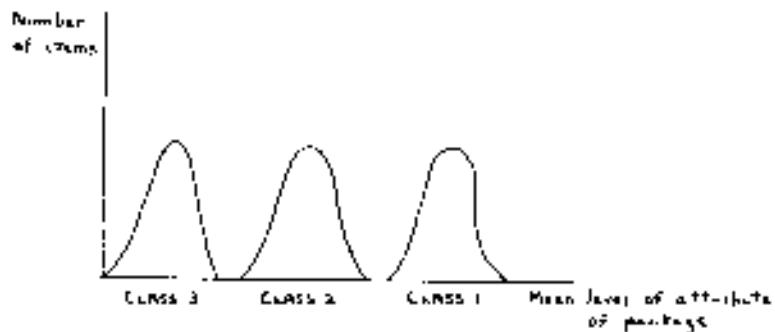


Figure 1. Distribution of packages in different grades with all items meeting category specifications

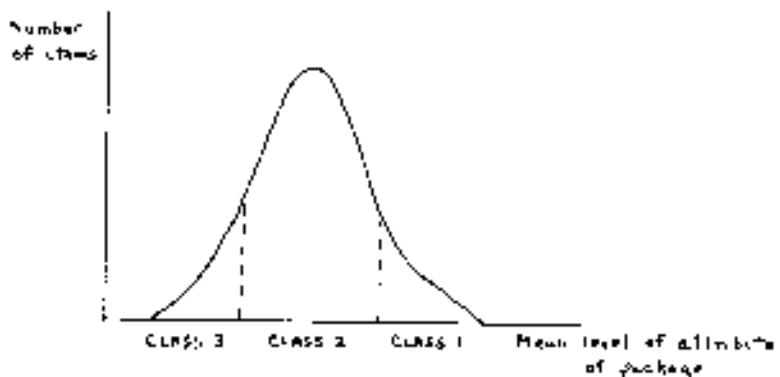


Figure 2. Distribution of packages in grades, when mean level of attribute determines grade

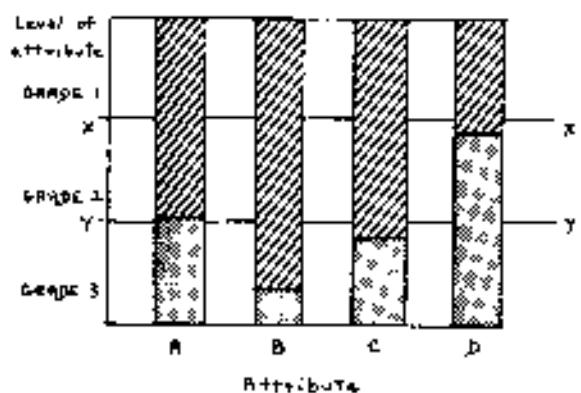


Figure 3. Conjoint choice with a conjoint classification

When buying purely on description the buyer knows that the item has been evaluated by one or more processes, usually CONJ, and then put into a grade using the ALL rule. This may not help him much in his choice. Figure 3 shows the situation when the product is sorted with a CONJ strategy and the consumer has a similar CONJ strategy. The level of the characteristics A, B, C, and D is shown on the Y-axis. If the level of any characteristic is below OX it cannot be in Grade 1. If any is below OY, it must be in Grade 3. The shaded area shows the quality that would be acceptable to a certain customer at a given price. The minimum level of characteristic A that he would accept is the same as the lower limit for Grade 2, but he is willing to accept lower levels of B and C. However, Grade 2 may not give him the minimum level of D he requires. If he wanted to be sure of getting his minimum requirements he would have to buy Class 1, which is not on offer at this price. The grading system is making him buy a higher quality than would satisfy him. The more characteristics there are in the specifications, the more likely it is that one irrelevant or unimportant characteristic will determine what grade an item goes into. Inevitably the cut-off point for at least one characteristic will be totally irrelevant for a substantial number of customers. One important implication is that, even if all characteristics are valued vertically by all consumers, "quality" is likely to be horizontal, over some ranges of qualities at least, because of different weights and evaluation procedures. If the buyer and seller have totally different evaluation strategies, one using LEX or AVG and the other CONJ, the grades are of even less value. This explains the very large number of grades used on commodity markets. It also explains the rarity in commodity markets of simple descriptions like "Grade A" compared with grades like "L2OF" for tobacco which gives separate codes for each characteristic - here L is position on plant, 2 is "quality", O is colour orange and F is maturity. One might speculate at length on what is the best purchasing strategy with given evaluation processes for allocation into grades and with given processes for evaluating what one consumes.

Elaborate theoretical models have related the utility of the consumer to the optimum production policy of the form on the assumption that the consumer uses compensatory evaluation techniques to satisfy a utility function. However even in a simple market the product will be evaluated many times. The housewife works out a household utility function, based on her own evaluation system and that of other members of the household. This could give rise to five inconsistent alphabets in lexicographic evaluation, and indeed, my mother regularly cooked three different meals for the five of us. The Fishbein model (Cohen, Fishbein and Ahtola, 1992), distinguishes between the extent to which the consumer believes that the brand (and by implication, the grade) is related to or possesses each characteristic and her evaluation of that characteristic. The retailer uses one evaluation in purchasing and others, possibly quite different, in setting prices, displaying and labelling (waste levels affect his profit but do not affect the consumer's satisfaction). The producer evaluates before deciding on a

sorting strategy, while sorting, and in deciding on a marketing strategy. Many of these evaluations are non-compensatory (e.g. CONJ); they use different characteristics, weights and cut-off points. Many are interrelated - a change in the sorting evaluation process changes optimal search and evaluation patterns throughout the system. Any expansion of the Lancaster (1971) model, for instance, to allow for even one or two of these non-compensatory evaluation procedures and their inter-relationships, would be impossibly complex, so it must be concluded that it is not worth following up this type of model building.

Obviously grades are not very helpful as the only means of description, especially with multi-characteristic products. However, when they are combined with even a limited degree of inspection, they can make search very efficient. If a buyer knows that every item in a consignment meets certain CONJ specifications he knows that there is no risk of a complete disaster and he can make a choice on one or two characteristics, using AVG or LEX perhaps. He may use characteristics that were not included in the specification. It is tempting to use mathematical models to examine the implications of different combinations of purchasing and sorting methods, but this examination should be confined to specific markets: no general analysis could allow for the multitude of sorting, marking, purchasing and consumption evaluation processes and the many degrees of inspection that could be combined, or for the combinations of weights used. Indeed, its practical value is likely to be confined to strategies for the purchase of industrial raw materials by a firm facing a perfectly elastic supply.

Characteristics may be negatively correlated - for example fresh eggs are most likely to have an obvious chalaza, which is unacceptable to many customers. Bender and Voss (1959) also show that it is not uncommon for a characteristic of major importance to some customers to be ignored by others and that this is very common over a small range. This confirms the prediction that with CONJ an important characteristic may not have any relevance to a particular decision (see also Day 1972). Smith and Koo (1973) mention disposal activities, some costless, as in not using the full speed of a car, some incurring a personal cost as in trimming the excess fat off meat or paying a butcher to do it and some incurring a social cost as in the disposal of waste products. CONJ grading in particular is likely to lead to such disposal activities. The seller has also a reject grade. Some goods, like electricity, have characteristics that satisfy many entirely different wants while other wants can be satisfied by entirely different characteristics (Abbott, 1955).

CONSUMPTION STUDIES

It has been shown above that it is impossible to make assumptions about the utility functions of economic man and to derive forecasts of the effects of a grading system and prescriptions for its design. All practical work must be based

on knowledge of how the market really works. Techniques for determining consumer preferences and, more particularly, for identifying market segments, have become very sophisticated in recent years, but they cannot usefully be applied without a sound understanding of the market and a realistic model. Rhodes (1955) has presented an excellent review of the pitfalls of this research, pitfalls which remain for even the best and most modern techniques

The use of multi-characteristic consumption studies goes back at least fifty years (e.g. Waugh, 1929). The most useful ignore the consumer's evaluation processes and concentrate on what consumers actually buy, if given the choice. Less useful, though helpful as a preliminary, are the studies which ask consumers to try several alternatives and state which they prefer: of course their statements give only a rough guide to what they would actually buy in a real market. Least useful, but, I fear, most common, are the studies produced by a committee of officials stating what they think consumers ought to want to buy (Bowbrick, 1980).

Consumption studies cannot predict the market effect. Test market results do not allow for the changes in supply and demand throughout the market when the grades are introduced. This is particularly so when the grading system is introduced for several goods which are close substitutes. Test marketing, too, is done with a limited, voluntary system, while the real system is likely to be universal and compulsory. Often a grading system is introduced because it is clear that the typical individual producer will benefit if he grades his product instead of selling it unsorted, but the impact on other types of producer is ignored, as is the fact that, if all producers sort their product, the increased supply of Class 1 will reduce its price and reduce the potential increase in revenue from sorting. The result may be a decline in revenue to the industry. Even the optimal solution for the industry will be sub optimal for many producers. Market research cannot deal satisfactorily with these problems.

It is even less easy to predict the effects on market structure of the introduction of a grading system or a major change in it. Williams (1962) argues that the introduction of the beef grading system broke the monopolistic position that the large U.S. packers had established for their brands. The effect of quality on competition is discussed by Chamberlin (1953) and Abbott (1955) and there is a lot of more recent work such as Dixit and Stiglitz (1977), though the effect of grades has not been discussed. The impact of grades on market structure cannot usefully be discussed except in relation to specific markets.

While market research related to specific markets is essential for rational policy formulation, the market research must be based on sound economic theory and analysis of the market structure as well as on market research techniques. It would be a mistake to assume that this research is cheap or easy.

COMPULSION

To an economist the fact that a grading system is ignored by the industry is *prima facie* evidence that the system or the specifications are inappropriate. The committee of officials that originally drew up the system often concludes instead that the system should be made compulsory. A strong case can be made for legislation against fraudulent labelling, but once legislation against this is drawn up, clauses are often inserted without any case being made, calling for compulsory labelling, compulsory sorting, compulsory minimum standards or even compulsory use of certain market channels.

To justify compulsion one would have to show first that the benefits outweigh the costs, second, that the use of the grading system is not in itself enough to give buyers or sellers sufficient benefits to ensure its use, and third, that the system cannot be adjusted to ensure its voluntary use without losing much of its value. One could argue that producers are too stupid to know what is good for them, that the benefits to the industry (especially of monopolistic marketing practices) only arise if everybody acts in concert or that the benefits do not accrue to the people who incur the costs. One would also have to show that the optimum system had to be compulsory because it did not give those benefits to producers, consumers and distributors which would normally ensure its use: it is very seldom that the supporter of a grading system will admit that it does not confer these benefits.

A single, well-designed compulsory grading system inevitably has some disadvantages over a system where there are several alternative sets of grades - it reduces freedom of choice, segmentation and information - but the benefits may outweigh the costs. A single, badly-designed, compulsory system is inevitably worse than a voluntary system, as traders cannot switch to a better one in response to market pressures. An intermediate degree of compulsion, where, for instance, sellers may use or ignore the statutory grades as they wish, can be satisfactory.

Two or three situations have however been mentioned above where the parties to a transaction do not benefit from the grading but others do. Price reporting and grades informing the customers that the qualities in stock are not the ones they want are examples. In some cases it might be argued that it does not pay any single buyer or seller to use grades, but nevertheless the public benefit from improved transparency etc. justifies compulsion. Such cases are rare.

DISCUSSION

This paper has shown that the economics of grading is extremely complex. It is possible, but not easy, to construct a model that is useful for decision-making in a specific market. It is not possible to construct a theoretical model which embraces

all the factors raised here, and which can be used to generalize about real markets. It is not possible to conclude that “Grading is a Good Thing” even in the limited sense we might say “monopoly is a Bad Thing.”

Predictions about real markets require specific models, backed up with market structure research and test marketing. Even so, the prediction may be no more than a guess, because the test marketing cannot allow for the changed supply and demand situation and market effects when the grading system is introduced. Since it is so difficult to make predictions about prices and quantities, I doubt whether welfare analysis is feasible.⁴

No comment has been made here on those staples of the textbooks, price transparency, marketing costs, or marketing efficiency. These must be the conclusions of an analysis, not the tools of the analysis.

The paper has set out those factors which I and others have found important in analysing real markets. These and other assumptions, should be clearly listed before model building and it should be explicitly stated which are being assumed away. In far too many studies, all irrelevant factors and most relevant ones are assumed away, accidentally and unwittingly, without the author realizing what he is doing. In many, not least in formal mathematical models, there are more implicit assumptions than explicit; the assumptions are contradictory and they change during the course of the analysis.⁵

Probably the biggest weakness in most analysis is the neglect of information. Perfect information is assumed, usually with buying on description, and perhaps homogeneous quality within a grade - which leaves one wondering what market and what goods the author could possibly be thinking of.

When discussing the advantages of a grading scheme, it is important to be clear what it is being compared with. Sometimes the benefits claimed are those of switching from perfect competition where everything must be inspected to monopolistic competition where nothing need be. Some benefits are those of switching from buying with no knowledge from a monopolist to buying with perfect knowledge under perfect competition. Sometimes both sets of benefits are claimed for a single grading scheme. In fact the alternative to a government grading scheme is usually an informal, voluntary scheme that has grown up in the trade, and that has many of the same advantages and disadvantages. Again, the confusion arises from not making one's assumptions explicit.

With one or two exceptions, no grading schemes I have seen or read of has clearly formulated aims. After the schemes has been implemented, its supporters will rattle off the textbook “Advantages of Grading” some of which

⁴ c.f. Lancaster, especially *Variety, Equity and Efficiency*, 1979.

⁵ E.g. Lancaster, who, in *Consumer Demand* produces some 108 explicit *ad hoc* assumptions, and an enormous number of implicit ones. His follow up, *Variety, Equity and Efficiency*, adopts all his conclusions from these *ad hoc* assumptions, and, implicitly assuming they apply when he uses an entirely different set of *ad hoc* assumptions, goes on to produce far reaching and completely untenable conclusions on social welfare and politics.

are contradictory and few of which are compatible with the grading scheme they have introduced. Since it is most unlikely that any one grading scheme can be designed to achieve more than one or perhaps two main aims the schemes usually end up achieving none.

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Peter Bowbrick

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Peter Bowbrick

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