Analysis of Food Consumption and Food Choice: A Multidisciplinary Approach

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1 Introduction

This paper is concerned with developments in the analysis of consumer behaviour with respect to food. The developments in different streams of research are reviewed. In particular attention is paid to the developments in the economic and behavioural analysis of consumer decision making. In conjunction with this distinction, differences between macro- and micro models of consumer behaviour have been treated. Our review intends not only to describe essential differences between the economic and behavioural approach, but aims also to illustrate the narrowing gap between both approaches. As a result the paper hopefully will stimulate co-ordination between economic and behavioural consumer research. The plan of the paper is as follows. First, differences between the economic and behavioural approach in the analysis of consumer behaviour are discussed in general. Afterwards economic analysis of the food consumer is reviewed. Both, conceptual developments and empirical results, which are relevant to the food consumer, will be surveyed. Next, behaviour analysis of the food consumer is discussed. Some final remarks on food consumer research, focusing on the relationship between consumer and product, underline the opportunities for co-ordination of economic and behavioural research of the food consumer.

2 Different approaches towards the analysis of consumer behaviour

Consumer behaviour with respect to food has been analysed in economic and behavioural sciences, i.e. psychological, sociological and anthropological sciences. Both have contributed to the understanding of food consumers. While the economic approach was dominant until the sixties, the behavioural approach has become, at least relatively speaking, more important in the past twenty years. Good co-ordination of these approaches is relevant to marketing of food and agricultural products, which takes consumer orientation as a basis for policy making. Much has to be done yet in this respect. 'Since mathematical economists like Gossen, Jevons, Walras and Edgeworth have developed a mathematical framework for the economic theory of demand, the relationship between the economic and behavioural approach towards consumer behaviour has widened' (Brown and Deaton, 1972). We agree with van Praag (1985) in his stance '...we should try to combine both scientific approaches in an endeavour to create a better understanding of the very complex behavioural processes in which both economists and psychologists are interested.' For that purpose it is useful to understand differences, similarities, respectively the convergence or divergence, between economic and behavioural consumer research (see for instance: Wierenga, 1983). In order to depict some basic differences in the economic and behavioural approach to consumer behaviour the S.O.R. (Stimulus, Organism, Response) model is a useful frame of reference.

In economic analysis of consumer behaviour, models are specified, which are in agreement with some basic axiomata about the consumer, and afterwards they are empirically tested. The organism transforming stimuli, like prices, into a response is not investigated as such.

Behavioural research of the food consumer is focusing on the way Stimuli are transformed into a response by the Organism. This is done by making assumptions about the structure and functioning, i.e. about the intervening variables, of the Organism and testing these assumptions afterwards. The partitioning in acquisition and integration of information, as portrayed in the figure, is made by Peter and Olson (1987). Similar classifications have been made by Engel and Blackwell (1982), who structure consumer behaviour as a problem solving process and by Howard and Sheth (1969), who partition the Organism in perceptual constructs and learning constructs.

In our opinion the economic approach of specifying a model of consumer behaviour on the basis of a priori assumptions, and testing the model afterwards, offers a useful but nevertheless too a narrow understanding of consumer behaviour for food marketing policies. The following considerations make it increasingly relevant for agricultural marketing policies to pay more attention to the intervening variables of the consumer:

– western food consumers have more discretionary income which gives the consumer more opportunities for choice.

– food demand in western countries is saturated in volume which makes food quality and food variety more important. It increases the importance of expressive product properties besides instrumental properties. As a result it is necessary to have a better understanding of the acquisition and integration of marketing stimuli by the food consumer.

– the increasing consumer knowledge about food characteristics and the greater variety in product supply make information reception and information processing by consumers a central issue in transforming market stimuli into a response.

– food marketing is spending more efforts on building market share and brand loyalty for specific varieties and brands than in stimulating the demand for generic products.

One might argue that economic theory is more interested in the demand for the generic product, which is more stable and to a large extent determined by economic and demographic variables. Consequently economics is dominating analysis of demand for food in general, and of demand for generic food products, while behavioural sciences are dominating the analysis of demand for varieties and brands.

It seems to us, however, that economic theory has much to say about consumers' choice of a brand or a variety of a generic product too. So, does the evolution of economic theory and research enhance a co-ordinated, or even an integrated, approach to the analysis of the demand for food? This question will be the guide-line to our review of the economic and behavioural analysis of food demand.

Economists have been aware of the drift of micro-economic theory of consumer behaviour away from reality. Behavioural scientists, in particular in the marketing discipline, have been aware of the limitations of their consumer studies being often partial and ad hoc. In both disciplines there are pieces of research and theory formation, which suggest convergence in the economic and behavioural analysis of the food consumer.

3 Evolution in the economic analysis of the food consumer

3.1 Basic elements of the economic theory on consumer behaviour

The neoclassical approach towards consumer behaviour is concerned with consumer's budget allocation over a set of goods so as to maximize utility. This approach is based on a set of axiomata which characterize the 'Economic man': completeness, transitivity, rational choice, non-saturation, continuity of preferences, strict convexity and smooth indifference curves (Green, 1971).

Economic theory has developed more realistic hypotheses about the way consumers transform economic stimuli into a market response. Houthakker (1961,) stated: 'the revealed preference approach also reinforced the emphasis on observable implications that is gradually transforming consumption theory from a mere philosophizing about utility to an essential component of empirical research'. Important extensions of the axiomata of micro-economic theory on consumer behaviour are following.

3.1.1 Dynamics of demand

Dynamics of demand have been tackled by various economists. Nerlove (1958) specified psychological, technological and institutional reasons for lagged consumer reactions on changes in income and prices. Koyck (1954), Nerlove (1958), Solow (1960) and Almon (1965) proposed different distributed lag models, $x_t = f(z_t, z_{t-1}, z_{t-2}, ...z_{t-n})$, for x_t =demand in t; z_{t-i} = price or income in t–i, for i = 0,1,....n ; f(..) = specific functional form,

which can take account of 'Carry over' effects of prices and income. While behavioural sciences might handle this dynamic aspect of consumer behaviour by analysing the impact of specific psychological variables, like habit formation or the perception of changes, Nerlove and his colleagues covered this aspect, in the micro-economic tradition, by a specific mathematical function. Houthakker and Taylor (1970) dynamited demand functions by modeling demand as the replenishment of stocks.

The dynamics of the explanatory variable income is expressed by Friedman (1957) in his Permanent Income '....the product of two factors: the wealth of the consumer unit, estimated as the discounted present value of a stream of future expected receipts, and the rate, r (or weighted average of a set of rates), at which these expected receipts are discounted' (Ferber, 1966). Modigliani and Ando (1960) introduced the permanent life cycle hypothesis to include the dynamic effect of future income in consumer decisions.

Another dynamic setting has been the introduction of highest income in the past in addition to current income as an explanatory variable (Duesenberry, 1949), in order to consider the fact that consumers try to emulate their peers.

3.1.2 Complete systems of demand equations

Economic theory of consumer behaviour has expanded also by developing complete systems of demand equations, which comprise the allocation of consumer's budget over a group of product categories or the allocation of total food expenditure to various generic products. This specification is a more consistent analysis of consumer behaviour as against the isolated analysis of the demand for specific products.

From economic utility theory a number of complete systems of demand functions have been derived, obeying the conditions of homogeneity, adding up and symmetry (see for instance Phlips, 1974; Deaton and Muellbauer, 1980).

The Linear Expenditure System (Stone, 1954b, Phlips, 1974, Powell, 1974), satisfying the conditions of adding up, symmetry and homogeneity of degree zero and additive separability, $x_i = g_i + (b_i/p_i)\,[y - \Sigma_j\, g_j\, p_j]$ for x_i = quantity demanded; y = income; p_i = price of i; g_i, g_j , b_i = parameters, where $g_i p_i$ can be interpreted as the minimum expenditure on i to attain a minimum subsistence level, $\Sigma_j\, g_j\, p_j$ as the subsistence income and b_i as the marginal budget shares (Phlips, 1974). The model rules out complementarity between and inferiority of product classes because of its foundation on an additive direct utility function. From the marketing point of view this is a disadvantage in analysing budget allocation over different varieties of a product. Dynamic versions of the L.E.S. have been proposed (see e.g.: Phlips, 1983).

The so-called Rotterdam model, another complete system of demand equations, which is based on an unspecified direct utility function (Theil, 1967; Barten, 1967) starts from the differential (Phlips, 1974): $dx_i = \delta x_i/\delta y\,[\,dy - \Sigma_k\, x_k\, dp_k\,] + \Sigma_j\, k_{ij}\, dp_j$ for x_i, x_k = quantity demanded; y = income; p_k = price of k.

Its drawback, at least from the marketing point of view, is that other variables than prices and budget are difficult to incorporate into the model.

The Indirect Addilog Model proposed by Houthakker (1960), which is based on an additive indirect utility function (Phlips, 1974):

$\log (x_i/x_j) = (\log a_i - \log a_j) + (b_i - b_j) \log y$, for x_i, x_j = quantity demanded; y = income

is commented by Brown and Deaton (1972). 'In summary, this system seems to have no clear advantages over the linear expenditure system: it is much more difficult to compute, more difficult to use, and apparently fits the data worse in situations where direct tests have been tried.' These complete demand systems have the disadvantage of being rigid with respect to the functional form and the relationship between parameters of different equations of the system. A more flexible model, the almost ideal demand system (AIDS) is proposed by Deaton and Muellbauer (1980):

$w_i = a_i + b_i \ln (y/P) + \Sigma_j\, g_{ji} \ln p_j$ for w_i = budget share of good i,
y = total budget to be allocated, p_j = price of good j and
$\ln P = a_o + \Sigma_k\, a_k \ln p_k + \tfrac{1}{2}\Sigma k\, \Sigma m \ln p_k \ln p_m$

This model is more attractive than other complete demand systems insofar it has no a priori restrictions imposed on the structural parameters abstracting from the theoretical properties of the cost function (see for instance Johnson et al., 1986; Deaton, 1986).

3.1.3 Other Extensions

Another extension of economic theory towards a more 'Real life' consumer has been the introduction of separability conditions under which micro-economic demand theory can be applied to a specific group of products (products x_1 and x_2 are separable, if the marginal rate of substitution between x_1 and x_2 is independent of the quantities purchased of other products $x_3 \ldots x_n$)(Leontief, 1947; Strotz, 1957).

In the characteristics of goods theory of Lancaster (1966), products are conceived of as a

bundle of characteristics, which are supposed to be objectively measurable. This solution to product grouping and product differentiation is similar to the perception of products as a bundle of benefits in the behavioural approach to consumer decision making.

In his discussion of separability of product groups Strotz (1957) depicts the utility maximising consumer more realistically as a decision maker who firstly allocates income over groups of commodities and determines afterwards the expenditure per product within these groups.

Other areas in which economic theory has disengaged itself to a certain extent from the rational consumer, as specified by the micro-economic axioms, are consumer behaviour with respect to product quality (see for instance Steenkamp, 1989) and to the acquisition and integration of information (Nelson, 1970; Tirole, 1989).

Micro-economic theory of demand in general, but also micro economic theory of the firm, have been criticized by the 'Carnegie Tech school of economic thought': '..the basic postulates of utility theory cannot in their present state be empirically confirmed. Consequently, the theory of utility is not refutable by empirical test.' (Clarkson, 1963,). But Clarkson's problem solving model of consumer behaviour did not get a strong follow up in economic theory and research. Problem solving models have been extensively used in the behavioural approach towards consumer decision making as will be discussed later on.

Having reviewed shortly some important developments in economic theory of consumer behaviour, in trying to become more realistic within the basic framework of the economic approach, we will draw attention to some empirical results in the analysis of the consumer of food and agricultural products. Empirical demand analyses are based on time series data, budget/cross section data or pooled time series and cross section data. Some results and developments in these classes of research will be discussed.

3.2 Economic demand analysis on the basis of time series data

Advances in demand analysis on the basis of time series data are related to model specification and estimation procedures.

3.2.1 Model specification

The specification of economic variables included in the demand function has not changed much since the work of Schultz (see for instance McFarquhar, 1971; Wöhlken, 1981; Boddez, et al., 1980).

In conjunction with prices and income additional explanatory variables have been included in demand functions. Schultz (1938) was among the first to introduce a trend, as an explanatory variable of the demand to encompass other market factors like changing consumption habits. Also various demographic variables have been introduced as explanatory variables in demand analyses on the basis of time series data. The index of consumer sentiment, based on the work of Katona (1951), has been introduced as an explanatory variable (Mueller, 1963). There has been an extensive debate on the explanatory power of this variable (van den Abeele, 1983; Praet, 1985). Seasonal changes have been covered by dummy variables. Promotion has been introduced, amongst others to explain the demand for citrus (Nerlove and Waugh,1961; Brown and Lee, 1986) and dairy products (Liu and Forker, 1988; idem, 1990). Consumers' concern about food products has been introduced in demand analysis amongst others to measure the effect of consumers' concern about cholesterol content of eggs (Brown and Schrader, 1990).

Demand analysis on the basis of time series data has made progress also by the use of specific mathematical functions. Distributed lags have extensively been applied (e.g. Gollnick, 1975). Various functional forms, logarithmic, double logarithmic, semi-logarithmic, have been used to allow for specific developments like saturation. Irreversible demand functions (Farrell, 1952; Wolffram, 1971; Houck, 1977) have been introduced to account for changes in consumers' tastes and habits.

3.2.2 Estimation methods

Estimation methods of demand functions on the basis of time series data has progressed tremendously since the pioneering work of Moore (1919). In spite of the classic paper of Working (1927) on identification of demand functions Schultz (1938) estimated demand functions by the single equation approach.

Estimation by simultaneous equations estimation procedures has mushroomed since the work of Haavelmö (1943), Koopmans and Hood(1953). It started out with a great number of studies in the United States (Girshick and Haavelmö, 1947; King, 1958; Meinken, 1955; Rojko, 1957; Gerra, 1959) and has become a classic procedure in food demand analysis. However, some authors recommend the use of recursive systems of equations, being '...the most general form of a theoretical model that is constructed as a chain of causation, and under general conditions their relations may be estimated without bias by ordinary regression analysis.' (Wold, 1953). Estimation of demand functions has also profited from other advances in econometric methods, like in the field of auto-correlation and multicollinearity.

On the basis of time series data also complete systems of demand equations have been estimated, like the L.E.S. system (Stone, 1954b; Huang and Raunikar, 1986; Veenendaal, 1984; Haen, Murty and Tangermann, 1982; see also Phlips, 1983; Johnson, S.R. et al., 1986). The so-called Rotterdam model, has been estimated on the basis of time series data amongst others by Barten (1967) and Lluch (1971).

Notwithstanding its sometimes weak theoretical basis, the single equation approach to demand analysis of agricultural products on the basis of time series data has flourished. Its attractive features as compared to complete systems of demand equations are flexibility of functional form and availability of data. Methodology of demand analysis on the basis of macro-economic time series data for generic products separately, like butter, tomatoes or potatoes, seems to have reached the ripening stage of the life cycle. Nevertheless such analyses are indispensable for a good understanding of the general market structure in agribusiness marketing. In fact more research of this type on the demand for agricultural and food products at EC and global level is needed.

3.3 Economic demand analysis on the basis of crossection data

Early work on demand analysis for food products often has been based on cross section data. Schultz (1938) refers to work of this type by Frisch and Marschak. Allen and Bowley (1935) were among the first to estimate linear relationships between food expenditure and total family expenditure, using linear Engel curves. The study of Prais and Houthakker (1955) had a great impact on this type of research. These authors introduced various functional forms, like logarithmic, semi-logarithmic and hyperbolic functions, allowing for special demand characteristics like saturation or zero-consumption below a specific income-level. However, Deaton (1986) qualifies the methodology of Prais and Houthakker as '...unashamedly pragmatic.' Nevertheless many studies on household budget allocation

have been performed along the lines of Prais and Houthakker (e.g. Ministry of Agriculture Fisheries and Food, (Annual Report); Filip und Wöhlken, 1984, Smallwood and Blaylock, 1981).

The specification of variables has received much attention in budget analysis. The distinction made between quantity consumed and total expenditure allows for determining the income elasticity of demand with respect to both quantity and expenditure. This is important information for marketing policies with respect to services and quality in food.

Differences in household size has received much attention (Blokland, 1976; Price, 1970; Pollak and Wales, 1981). Price (1986), Alessie and others (1987) have projected the effect of changing household composition on consumption.

The Indirect Addilog Model has been estimated on the basis of budget data by various authors (Somermeyer and Langhout, 1972, Parks, 1969).

The opportunity to measure the effect of demographic and social variables is an attractive feature of budget analyses. Unfortunately, cross section analyses offer limited opportunities for analysing the relationship between demand and prices, or other marketing variables, like promotion.

3.4 Economic demand analysis on the basis of combining time series and cross section data

Cross section and time series, like household panel data, can be pooled in estimating demand functions. The choice of the estimation procedure in that case will depend on the assumptions made with respect to homogeneity of parameters over households (for a classification of estimation models see for instance Johnston, 1984).

Analysis of consumer demand on the basis of pooled cross section and time series data has been also executed on the basis of complete demand systems amongst others for flowers by van Tilburg (1984), and for dairy products by Heien and Wessells (1988).

The potential of combining time series and cross section market data is increasing. The collections of such data both at country and at EC level should be improved in order to serve marketing policies of agricultural products.

4 Consumer Decision Making from the Behavioural Point of View

4.1 Introduction

While economic theory is proposing and testing consumer decision making models, which are derived from axiomata about the consumer, behavioural analysis of consumers typically is testing assumptions about specific aspects of consumer behaviour. However, during the past twenty-five years also behavioural models have been proposed which intend to depict the total consumer decision making process.

Our discussion of behavioural consumer research will concentrate on research and models emphasizing differences and similarities between behavioural and economic research. Various comprehensive models of consumer decision making, being essentially of a conceptual nature, are useful in this respect. For instance, the EKB model (Engel, Blackwell, 1982,) portrays the consumer as a problem solver, who passes the stages of problem

recognition, search, alternative evaluation, choice and outcome. Similar models have been proposed by Nicosia (1966), Howard and Sheth (1969), Bettman (1979) and Howard (1989). They have been empirically tested to a limited extent (see for instance Termorshuizen, et al., 1986). The behavioural approach is focusing in particular on the acquisition and the integration of information, being two central elements in the decision making process of consumers.

Some central issues of the behavioural analysis of consumers will be reviewed within the framework of a problem solving process. Also some attention will be paid to routinized response behaviour and low involvement decision making, being familiar types of decision making in food consumption.

4.2 Consumer behaviour as problem solving

4.2.1 Problem recognition

Problem recognition is triggered by wants and needs of consumers. Classic schemes of needs are amongst others the distinction between primary, (biogenic), and secondary needs (sociogenic), the hierarchy of needs (physiological, safety, social, ego and self actualization) proposed by Maslow and a trio of needs (Power, Affiliation and Achievement), (see for instance Schiffman and Kanuk, 1987). The influence of life styles and values on consumers' motives is important with respect to food products. The VALS (Values and Life Styles) concept of the Stanford Research Institute (Mitchell, 1983) is a case in point.

4.2.2 Search

Acquisition of information has received great attention in behavioural analysis of food consumers. It is the central theme in the consumer choice model of Bettman (1979). Bettman differentiates internal search versus external search and active versus passive search. He stresses the relationship of information seeking with other elements of the decision process. An example is information seeking and processing in relation to consumers' Choice by Processing Brands as against consumers' Choice by Processing Attributes. Engel and Blackwell (1982,) argue: 'It appears that CPB is most likely when the consumer either has a fairly high level of product knowledge of previous purchasing experience.' Limited information processing capacity of consumers and 'Information Overload' have been debated at length (for instance: Jacoby, 1984; Malhotra, 1984).

Perception has been analysed as an important intervening variable in information processing; Bayton (1963) ascribed a central role to perception in a Stimulus—> Perception—> Response model of consumer behaviour. Howard and Sheth (1969) distinguished in consumer decision making with respect to a brand a set of perceptual constructs, like perceptual bias and stimulus ambiguity. Perception of product quality has become an important issue in marketing of food and agricultural products (Steenkamp, 1989). Perception analysis on the basis of multivariate statistical methods has contributed a great deal to the positioning of products and to benefit segmentation.

A specific perceptual feature is the risk a consumer observes in a product. Risk perception is becoming more relevant to food marketing, since consumers are bombarded with information about health and environmental elements of food products.

4.2.3 Alternative evaluation.

Stimuli acquired by the consumer are integrated into intervening variables, like attitudes and preferences, which influence product choice. The 'Means-end' model (Gutman, 1982; Peter and Olson, 1987) assumes that physical product properties are translated by consumers into benefits, which ultimately fulfil terminal values, like freedom, progress, happiness, achievement. In this way consumers evaluate the potential contribution of a product to the fulfilment of their wants and needs. Behavioural analysis has made great efforts to establish consumers' evaluative criteria. Multivariate analysis has been an extremely important instrument for that purpose (see for instance Green, et al., 1989).

Measuring consumers' attitudes has become a standard procedure. The modified Fishbein model (Engel, Blackwell, 1982) – the summated mathematical products of scores on the evaluative criterion times the weight of importance – has been applied amongst others in measuring consumers' attitudes with respect to liquid milk (Termorshuizen, et al., 1986). Preference analysis by multidimensional scaling (Green, et al., 1989) and by conjoint measurement (Green and Srinivasan, 1978) has become an important area of consumer research.

4.2.4 Choice

In comprehensive problem solving models the actual choice is modelled to a limited extent. For instance in the EKB model choice is described as a process determined by buying intention and a number of unanticipated circumstances. In fact consumers' reactions on prices and income, central issues to economic researchers are not included in the choice process.

4.3 Routine behaviour, and low involvement decision making of consumers

Consumer behaviour with respect to food is to large extent routinised behaviour, amongst others because of habit formation and costs of information. Also it is argued (Krugman, 1965) that consumers might be low involved in purchasing a specific brand or variety, which might lead to the formation of an attitude after having chosen a product (Engel and Blackwell, 1982).

Routinised behaviour with respect to food varieties and brands has been described by stochastic models. Markov processes and linear learning models have been successfully applied to brand choice models of consumers (Massy, Montgomery and Morrison, 1970; Wierenga, 1974). Ehrenberg (1972) has applied the negative binomial distribution to describe consumers' choice of frequently purchased goods.

Brand loyalty models have been extended by including marketing variables, like prices, into the model (Lilien, 1974; Böcker, 1982). Based on the axiomatic theory of constant utility (Luce, 1959) the multinomial logit model has been developed, which can be applied to stochastic consumer behaviour with respect to brands and varieties of non durable goods (see for instance Jones and Zufryden, 1982; Bewley and Young, 1987).

5 Integration of economic and behavioural approaches, some final remarks

Our review demonstrates how economic analysis of consumers has incorporated behavioural elements and how on its turn behavioural theory has accommodated models by incorporating economic variables. Shortage of space prevents a thorough discussion of

this trend towards a better interplay between behavioural and economic research of the food consumer. We will restrict our discussion to some final remarks about the relationship between consumer and product.

– Several authors have integrated economic and behavioural models of consumer choice (e.g. Hauser and Simmie, 1981; Hauser and Shugan, 1983; Wierenga, 1984). In these models objective product characteristics are assumed to be mediated by consumer perception in their effect on consumer preferences. This approach allows researchers to link the behavioural concept to the economic concept of characteristics and renders the findings of marketing research more actionable for product development.

– Consumer's perception of product quality is analysed in behavioural studies assuming that consumers evaluate products on different criteria. In the characteristics of goods theory in economics, utility is derived from product characteristics. However, in economic theory product characteristics are assumed to be objectively measurable, which is not the case for criteria like taste and convenience in behavioural analyses. The gap between cognitive evaluations of consumers and objective physical product properties of food should be narrowed, amongst others by sensory research of food products.

– In analysing information acquisition by consumers about product quality, economic theory differentiates goods in search goods and experience goods (Nelson, 1970). In behavioural models experience instead of search is assumed to be a dominating information source for consumers in case of low involvement (Engel and Blackwell, 1982).

– In behavioural research price has been introduced as an indicator of quality, while economists have introduced hedonic prices as a measure of quality. Gabor and Granger (1966) developed a truly interdisciplinary model by setting the probability that a consumer will buy a product at a specific price equal to one minus the probability that s/he considers it too expensive, respectively minus the probability that s/he considers it of too a low perceived quality at the given price.

Foregoing examples demonstrate opportunities for a better interplay between economic and behavioural analysis of the food consumer. The expansion of research methodology, like logit analysis, and better market data, like household panel data and scanning data, enlarge opportunities in this respect. Food marketing will profit greatly from further advances in this field.

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