Agricultural Marketing and Consumer Behavior in a Changing World

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edited by

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This book is dedicated to Matthew T.G. Meulenberg

Professor of Marketing and Marketing Research at the

Wageningen Agricultural University, 1965-1996

AGRICULTURAL MARKETING AND CONSUMER BEHAVIOR IN A CHANGING WORLD

CONTENTS

AGRICULTURAL MARKETING AND CONSUMER BEHAVIOR IN A CHANGING WORLD

Preface

This book offers a contemporary perspective on marketing and consumer behaviour with respect to agricultural and food products. The work is a collection of contributions from authors, active in different fields, institutions and countries. This variety of contributors not only makes it possible to have real experts on the different subjects, but it also presents an interesting diversity as to the content of the book. The reader will observe, however, that there is sufficient commonality in the different contributions to ensure the necessary coherence betweent the fifteen chapters. This common factor is, among other things, due to the following three features.

Connecting features

First, there is the emphasis on *change* throughout the book. The domain of agriculture and food is subject to a process of fundamental changes, caused by factors such as deregulation, globalization, the information revolution, genetic engineering, changes in consumer attitudes, life styles and behaviour, changes in the media and in distribution. The contributions will help understand and interpret these changes and discuss how to cope with them in marketing at different levels of the agrifood chain.

Second, the underlying view in this book is that the *same principles and approaches* apply to marketing in the agrifood sector as to marketing in general. It is shown, for example, that concepts and methods, such as market orientation, competitive strategies, power in distribution channels, brand equity and methodologies for market segmentation developed in general marketing, provide interesting insights into the area of food and agriculture. This does not imply that the agrifood domain does not have specific characteristics that should be taken into account in marketing. One such characteristic is that marketing in the agrifood sector is almost always a joint operation of several parties that cover the stretch between the original producer and the ultimate consumer. For this reason, the marketing channel, consisting of the whole set of parties contributing to the marketing process, should be taken into account. This *marketing channel approach* is a key element throughout the book.

Third, it is demonstrated throughout that an *interdisciplinary approach* is needed to understand what is going on in agricultural marketing. This becomes most clear in the chapters on consumer behaviour with respect to agricultural and food products. Most important there are the behavioral (predominantly psychological) and the economic approaches. Only by simultaneous application of different disciplinary perspectives can a more profound knowledge about the issues and problems in this field be gained.

Brief content of the book

The fifteen chapters of the book are distributed over three different parts.

Part I: **The changing competitive environment** contains four chapters. Three of them take a broad approach and put the situation of agricultural marketing in the perspective of the changes mentioned earlier. The paper by *Grunert, Harmsen, Larsen, Sørensen and Bisp* focuses on market orientation in food and agriculture, on key success factors and product innovation. *Wierenga* deals with the implications of information technology, the importance of partnerships between companies in the agrifood channel and discusses how these and other elements will determine the future competitive position of individual companies and the sector as a whole. In the third of these "broad" papers, *Janssen and Van Tilburg* shift the scene from marketing in western economies to the issues and problems of agricultural marketing in developing countries and discuss how the marketing systems there should adapt, react, anticipate and initiate in the light of the dynamic environment. In the last paper of Part I, *Den Ouden, Huirne and Dijkhuizen* deal with a more specific topic: how to take into account consumer preferences with respect to animal welfare (an important emerging environmental factor) in decisions on housing, transportation and slaughtering.

Part II: **Evolution in channels and institutions** starts with the contribution by *Meulenberg*, who links a classical concept from the marketing field, marketing institutions, to the concept of marketing channels. He shows that the strategic position of many traditional marketing institutions will be affected by current changes. Much empirical work is needed on the balances of power and information between parties in the agrifood channel. In a study on the relationship between manufacturers and supermarket buyers in the food channel, *Van Bruggen and Bucklin* demonstrate how this can be done. As agricultural markets become more volatile and dynamic, farmers will look for possibilities to limit their price risks. One possibility is to hedge on a futures markets, and in the third paper of Part II, *Pennings and Meulenberg* study the hedging risks that farmers are exposed to when operating on such markets.

Part III: **Dynamics in consumer behavior** starts with a comprehensive paper by *Steenkamp* that gives a state-of-the-art account of what we know about consumer decision processes with respect to food and how to study these processes. He also discusses cross-cultural and international issues regarding food consumption. *Wedel*

presents a new statistical methodology for the discovery of (latent) sensory dimensions and consumer segments for food products in (barcode-) scanning data. *Van Trijp, Steenkamp and Candel* apply the brand equityapproach to measuring the effect of a Dutch pork label (IKB). In an era of increasing consumer concerns about health risks associated with food, such labels may well become important. A new methodology for studying motivations (attitudes, consequences, values) behind consumer behaviour is means-end analysis through laddering. *Audenaert and Steenkamp* present an introduction to this method together with an application to beef.

The last four papers of Part III deal with economic approaches to consumer behaviour. *Böcker* develops a Hotelling type of model for studying effects of product differentiation for varying types of consumer behaviour and firm strategies. The other three papers have in common that they apply a demand system approach to examine various issues with respect to the demand for food products. *Molina and Rosa* test the intertemporal separability hypothesis for Italian food demand. *Barreira and Duarte* study changes in Portuguese food consumption over time. *Angula, Gil and Gracia* study differences in food demand of consumers in different European countries. It is interesting that while major differences used to exist between, for example, the Mediterranean (cereals, fruits, vegetables) and the North-European (meat, milk, dairy products) diets, a convergence of diets is now taking place in Europe.

Idea for the book

Although the changes that take place in the agricultural and food sectors are sufficient reason to compile a book like this, the immediate cause for this volume was the retirement of Professor Matthew T.G. Meulenberg from Wageningen Agricultural University in September 1996. For more than thirty years (since 1965) he held the Chair of Marketing and Marketing Research at this university. As a scientist, a teacher, advisor to the agribusiness and the government, Professor Meulenberg has made an important contribution to the development of marketing, inside and outside the domain of agriculture. He was the PhD supervisor of four of the five editors. In Wageningen an International Seminar (organized by the European Association of Agricultural Economists) was held in his honour in March 1996. The chapters of this book are a selection of the papers presented at this Seminar.

Acknowledgements

The editors of this book wish to thank all people who have helped to realize this book. First of all, the authors who were willing to make their work available for this volume and who were patient enough to go with us through the reviewing and editing process. Second, our colleague Aad van Tilburg, who not only served as an editor, but also took care of the, often complicated, logistics of the editorial process. We also wish to thank Jaap Bijkerk from Wageningen Agricultural University and

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Rotterdam/Wageningen,
September 1996

PART 1

THE CHANGING COMPETITIVE ENVIRONMENT

NEW AREAS IN AGRICULTURAL AND FOOD MARKETING 1

Klaus G. Grunert[1], Hanne Harmsen[1], Hanne Hartvig Larsen[2], Elin Sørensen[1] and Søren Bisp[1]

1. Marketing in food and agriculture

There is wide agreement in the public debate that the food industry in Western industrialised countries is entering a difficult period. Several tendencies taken together work to increase the competitive pressure on food companies (Grunert et al., 1996):

- In affluent economies, it is one of the laws of economics that growth in markets for food products, if any, is not in terms of quantity, but in terms of value.
- Most industrialised economies are characterised by an oversupply of agricultural products.
- A global tendency towards deregulation, decrease of government subsidies to producers of agricultural and food products, and reduction of trade barriers removes many of those shields which have protected food companies from competition in some countries.
- Consumers are believed to become less predictable in their behaviour, as consumer demands become more fragmented and less consistent.
- Concentration in the retail sector has resulted in powerful agents. Not only do the agents exercise an important gatekeeper function but they can also put competitive pressure on food manufacturers.

As a result, the intensity of competition on Western industrialised food markets is generally expected to increase. These developments have spurred food producers to renew their interest in food products with more value-added, in increased research and development, in the development of new products and processes. It has been noted that the food and beverage industries score notoriously low in terms of R&D investments when compared to other industries (Grunert et al., 1995), and that this must be changed as a consequence of the tendencies towards increased competition mentioned. It has, however, also been argued that such technical orientation towards improving their competitive position may be fruitless unless it is accompanied by market orientation, i.e., the development of skills and resources which enable a company to detect, influence, and fulfil customer needs on the market.

Market orientation, and the skills and competencies related to it, are topics which have been central in the scientific analysis of marketing problems. It is our fundamental premise in this paper that many of the research issues addressed in general marketing may be fruitfully applied to agricultural and food marketing, though they may require certain adaptations.

In the following, we will first elaborate on the concept of market orientation and its measurement, and how it may have to be adapted when applied to the food sector. We will argue that the fundamental purpose of all marketing research should be to help companies in becoming more market-oriented. We then look at four areas of marketing research in more detail: market key success factors and perceptual skills of decision-makers, market-oriented product development, retail decision-making, and consumer behaviour. For each of these areas, we start with a short review of the state of the art in general marketing research, including measurement issues where appropriate. We then deal with specific aspects when applying these concepts to food and agriculture, and present examples of research where this has been done, drawing on the research which has been done under the auspices of the MAPP Centre. Each section will close with some suggestions for future research.

2. Market orientation and its measurement

2.1. The concept of market orientation

Being market-oriented is a major cause of business success is the fundamental proposition of the marketing profession. It has, in various forms and guises, pervaded the marketing and management literature since the fifties (for example, Drucker, 1954; for a review see especially Dreher, 1994). Only recently, however, has there been progress with regard to the term's conceptual clarification, and only recently has there been empirical evidence of the relationship between market orientation and business performance. The present most commonly accepted definition of market orientation has been set forth by Kohli and Jaworski (1990, 1993): *Market orientation is the organisationwide generation of market intelligence, pertaining to current and future customer needs, dissemination of the intelligence across departments, and organisationwide responsiveness to it.* Kohli and Jaworski have also developed a simple questionnaire device to measure a company's market orientation (Kohli, Jaworski & Kumar, 1993). Using this device, they have conducted empirical research on both the antecedents and effects of various degrees of market orientation. Their major result concerning the effects of market orientation is that a higher degree of market orientation is associated with higher overall performance. Perhaps even more interesting is their finding that the strength of this relationship is not affected by factors like market turbulence, technological turbulence, and strength of competition. A priori one may be led to believe that higher degrees of market turbulence and of strength of competition make market orientation more important, or, put in another way, that market orientation is less important in stable market environments. Also, one could a priori believe that on markets where market dynamism is mostly attributed to technological progress –

this may characterise some markets in food and agriculture – market orientation becomes less important. This does not seem to be the case: The effect of market orientation on overall performance was pervasive.

This positive relationship between market orientation and business performance has been corroborated in other studies (Deshpandé, Farley & Webster, 1993; Narver & Slater, 1990; Ruekert, 1992). Narver and Slater's study (1990) is especially interesting from a food and agriculture perspective. Narver and Slater collected data on the forestry industry, distinguishing between commodity and non-commodity businesses. For non-commodity businesses, there was a monotone relationship between market orientation and business performance. For commodity businesses, however, the relationship was U-shaped. Businesses with the highest degree of market orientation had the highest degree of profitability, and businesses with the lowest degree of market orientation had the second highest profitability, with businesses with a medium degree of market orientation 'stuck in the middle' with very low profitability. This phenomenon was explained as follows: for commodity businesses to become market-oriented requires a major effort and has to pervade the whole organisation, whereas companies making half-hearted efforts will incur costs without being able to reap the benefits.

All marketing research has, in one way or another, the potential application of making commercial actors more market-oriented. Research on buyers should enable producers or sellers to act in a more market-oriented manner. Research on company decision-making, be it at the strategic or the tactical level, should enable these decision-makers to make decisions which will ensure more success on the market. However, in much of the research actually carried out in our field, this common thread tends to be lost. Research on consumers is being conducted without considering how it could enter into producers' decision-making. Often research on retailers concentrates on general structural developments instead of generating knowledge that could make producers more market-oriented vis-à-vis retailers. Research about competence building in companies is more oriented towards inward explanations of competence development than towards outward evaluations of how competence building relates to the market environment.

Marketing research ought to be concerned with remedying the informational gaps which exist in economies based on a division of labour. Knowledge about one group of actors becomes useful mainly by making it available to and turning it into implementable decisions for another group of actors.

2.2. Market orientation in food and agriculture

Market orientation is the common thread which we would like to propose for research on agricultural and food marketing as well as in general marketing Actually, it is evident (Bove, Harmsen & Grunert, 1996) that the food sector may be more in need of improving its level of market orientation than many other industries.

When applying the concept of market orientation to the agricultural and food sector, we regard it as important to replace the predominant dyadic view of company activities with a chain view. Present concepts of market orientation are based on a dyadic view of company activities: A company faces a market with a number of potential or actual customers. However, most dyads form part of a larger chain, and this is certainly true for the food sector. All companies which in some way or another are concerned with the production and distribution of food products base their livelihood on the value consumers perceive in the products manufactured. If, for example, consumers are no longer interested in eating beef, then the cattle could be used only for milk production, and there would be no point in slaughtering, cutting, packaging and distributing meat. So even though most actors in the food chain never are in personal contact with consumers, their existence depends on the fact that the product they contribute to at some point reaches a consumer and is perceived by him/her as so valuable that s/he is willing to pay a price for the product which covers the costs incurred by all actors in the food chain. At each link in the food chain, actors make decisions about the purchase of products and services, and a supplier's market orientation in each of these dyads can be analysed. However, at each link in the food chain, except at the consumer stage, customer wants and expectations will at least in part be derived from expectations for the resaleability of the product to the next actor in the chain. Then market orientation is no longer to be analysed at the dyadic level, but at the chain level.

2.3. Measuring market orientation in food and agriculture

Instruments developed for the measurement of market orientation have up till now been questionnaires which company decision-makers (usually one or two) fill in on behalf of the company or business unit (Kohli, Jaworski & Kumar, 1993; Narver & Slater, 1990; Ruekert, 1992). The MARKOR instrument developed by Kohli, Jaworski and Kumar (1993) is the most well-known example.

All these instruments have a *dyadic orientation* in that they explicitly or implicitly deal with an undifferentiated view of customers, a point that has also been raised by Van Bruggen and Smidts (1995). In this way, market orientation is mainly regarded as a company's ability to interact with, collect information about or survey their direct customers. For companies producing and marketing consumer products, it seems highly relevant to include intelligence generation about end users. Information on end user needs and trends is crucial, as ultimately the value that end users perceive in a product sets the limit for the price and consequently the earnings for the entire value chain. A thorough understanding of consumer value perception is therefore important, especially for activities such as new product development and market communication. In practice, many companies rely on end user information from their direct customers. However, channel structures usually do not ensure an end user-to-manufacture information flow, because products are distributed through

a channel with a large number of distributors simply not having the kind of information about end users that manufacturers need (Grunert et al, 1996).

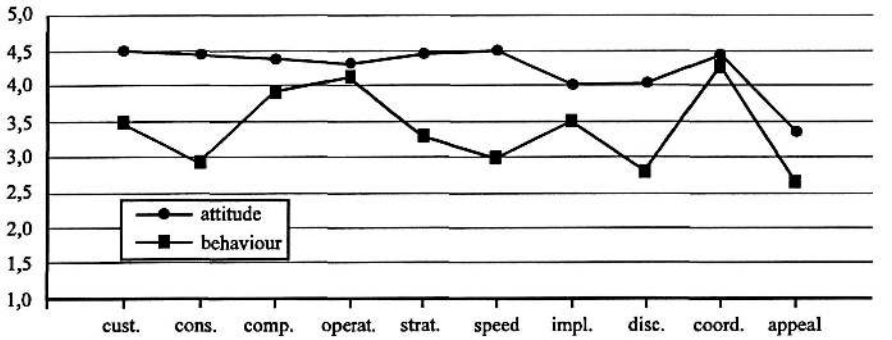
Also, the existing measurement instruments all rely on an *informant approach*, i.e., one respondent evaluates the activities performed by the company or the business unit. While this approach has practical advantages, it does not take into account the fact that different actors in a company probably perceive the level and quality of market-oriented activities differently. This is especially relevant when measures of market orientation are to be used not only for cross-sectional purposes, but also for diagnostic purposes, aiming at increasing the level of market orientation of a particular company.

When moving from an informant approach to an *individual approach*, it may also be useful to supplement the *activity-based* approach MARKOR and others are based on with an *attitude-based* approach. From the perspective of diagnosis and change, it may be relevant not only to look at the specific activities undertaken in order to find out which areas to reinforce, but also to look at respondents' attitudes toward these activities. Attitudes are usually presumed to precede behaviour and can give important information on the likelihood of being able to change behaviour. If an individual in an organisation has a very positive attitude toward sharing market information with colleagues, but currently does not do so because of rigid organisational structures, it is likely that he would undertake that activity if organisational structures were softened. If he, on the contrary, had a more negative attitude toward sharing information, for example because he sees information as his own power base, he would probably be much less inclined to engage in that activity even if organisational structures were softened. The possibility of increased levels of market orientation can thus be related to the size of the gap between attitude and behaviour and the nature of the situation specific factors explaining the gap.

Figure 1 shows a proposed dimensional structure for such a revised instrument to measure market orientation (Bisp, Harmsen & Grunert, 1996). Each element is measured by three items. Figure 1 shows the perceived behaviour as well as the attitudes toward specific activities as an average across all respondents interviewed within one particular food company (details can be found in Bisp, Harmsen & Grunert, 1996). As could be expected, attitudes toward market-oriented activities are more positive than activities across all dimensions. What can also be seen is that gaps between attitude and behaviour vary across the different dimensions. While the presentation of market data is not perceived as being very good, results on the attitude scales reveal that respondents do not find appealing presentation of market data to be very important. It can further be seen that respondents do not engage very much in generating information about the consumer. However, the attitude towards the activity is very positive, indicated by a large gap. There is another big gap for the activity 'formally meeting to discuss issues of market relevance'. Respondents judge the activity in a positive way, but are not very engaged in it. Finally, the figure shows that respondents reckon with the value of good market information in

strategy and planning. Actual behaviour as perceived by respondents is, however, far from the attitudes expressed.

2.4. Future research



Dimensions of market orientation			
	Market intelligence focus:		*Action levels:*
cust.	customers	operat.	operational
cons.	consumers		(adaptation)
comp.	competitors	strat.	strategic
	Appeal:		(forecasting)
appeal	presentation of data		*Competencies:*
	Organisation:	speed	speed of reaction
disc.	discussion of market development	impl.	implementation of plans
coord.	co-ordination of activities		

Figure 1: Attitude towards dimensions of market orientation and evaluation of actual market-oriented behaviour (average across respondents from one company, n=51) (adapted from Bisp, Harmsen & Grunert, 1996)

Information of the type shown in Figure 1 can be useful in diagnosing market orientation and identifying possible areas of change. The information can also be

used to measure changes in degree of market orientation. The instrument presented is preliminary and far from well-established. Many areas for research open up: the development of more reliable scales, investigation of the validity of the scales with regard to various measures of company performance, the predictive value of attitude measures with regard to willingness to acquire new competencies, the relationship between gaps identified and various ways of developing and implementing market-oriented skills in food companies.

3. Market key success factors and perceptual skills of decision-makers

3.1. Market orientation and the concept of key success factors

Market intelligence generation is usually equated with the application of formal procedures for data collection. However, actual business performance is probably more influenced by the informal procedures by which decision-makers monitor their environment in their daily work, and by which they establish their own subjective models of the determinants of business success.

The question of the causes of success is, of course, at the very core of all marketing research. One of the core assumptions of research on marketing strategy has been that the match between environmental conditions and firm-specific factors is a major key to explaining differences in business performance. The major task faced by decision-makers in business can thus be viewed as bringing about this match, by perceiving both the business environment and intra-business factors, interpreting them on the basis of previous experience, and using the knowledge thus accumulated to make decisions about which skills and resources to develop in the company.

The concept of *key success factors* (e.g., Grunert & Ellegaard, 1993) is one way of framing this problem of the match between environmental conditions and intra-business factors and the way it relates to managerial decision-making. Grunert and Ellegaard (1993) have defined a key success factor *as a skill or resource that a business can invest in, which, on the market the business is operating on, explains a major part of the observable differences in perceived customer value and/or relative costs.* Knowledge about key success factors is or rather would be of obvious practical managerial relevance: if the key success factors in a particular market could be ascertained, this would give useful guidelines with regard to competence development in businesses in the respective market. It has, however, been argued that such knowledge is not only difficult or impossible to achieve, but would also be useless when attained: to the extent that the true causes of success in a market would be understood in such a way that all actors on that market could implement them without difficulty, they would immediately cease to be causes of success, since they would not give anybody an advantage. From the resource-based perspective towards analysing the causes of competitive advantage it has therefore been argued that only complex and ill-understood skills, resources and competencies can be real sources of sustainable competitive advantage (Barney, 1991).

An intermediate view in this debate (taken, e.g., by Grunert & Ellegaard, 1993; and Sousa de Vasconcellos e Sá & Hambrick, 1989) is that causes of success may be moderately stable within clearly defined markets over a mid-term time perspective, that they are partly but not completely understood by decision-makers in these markets, that they are therefore amenable to empirical research, and that a superior understanding of them can improve a company's competitive positioning at least for a certain period of time by leading the attention of decision-makers to areas where investing in skills and resources will have most impact on performance. This then leads to a different view of key success factors, namely to how managers *perceive* the determinants of success in a market, and how accurate their perception is, i.e., to which extent their perception is biased due to limited information, perceptual distortion, and other forms of various cognitive biases (Barnes, 1984; Schwenk, 1988).

Research on key success factors then becomes an aspect of research on market orientation: Perceiving the causes of success on a specific market correctly and using this knowledge for the development of skills and resources would be a major aspect of being market-oriented.

The question of how managers perceive key success factors has as of yet not been addressed in the literature on key success factors. In so far as there is empirical research on key success factors, it has focused on the objective causes of differences in success, as exemplified by research in the PIMS tradition, and, at the industry level, the study by Sousa de Vasconcellos e Sá and Hambrick (1989). Subjective causes of success have also been addressed in empirical research in the managerial and organisational cognition tradition, mainly in the way that decision-makers' perceptions of causal links between actions and outcomes have been uncovered by interview techniques and summarised in cognitive maps (e.g., Bougon, Weick & Binkhorst, 1977; Cossette & Audet, 1992; Narayanan & Fahey, 1990). These studies have not invoked the key success factor concept, however, and, more importantly, they have not attempted to compare perceived to actual key success factors.

Knowledge about discrepancies between actual and perceived key success factors would have a number of useful practical implications. First of all, providing decision-makers in business feed-back about possible discrepancies between actual and perceived key success factors will contribute to better strategy formulation and implementation. Secondly, this knowledge can be applied in designing market surveillance systems, especially the surveillance of competitors. Often competitor analysis suffers from a lack of framework that may helps reduce the abundance of potentially relevant information to a few key items. If information collected in competitor analysis is structured around actual and perceived key success factors, one would obtain information about competitors' actual abilities to successfully pursue alternative strategic courses as well as about the assumptions on which competitors are likely to base their strategic decisions. Finally, if we know to which extent or under which circumstances decision-makers can be expected to perceive

the causes of success correctly, this would give researchers valuable information on when an interview with a decision-maker would be sufficient to uncover the major driving forces in an industry.

3.2. *Measuring actual and perceived key success factors in food and agriculture*

Figure 2 shows results from a study on perceived key success factors in the European yoghurt market (from Sørensen & Grunert, 1996). Marketing managers in Denmark, Germany and the United Kingdom were first interviewed using a reverse laddering technique. Later they filled out an implication matrix, which was then analysed by means of a network scaling approach. Figure 2 shows the most prominent paths which are related to achieving *high perceived value.* Thicker arrows correspond to shorter link lengths and consequently to a larger number of respondents mentioning this link. There are several noteworthy observations in this diagram. Firstly, there are two direct determinants of *high perceived value: attractive packaging*, and *high product quality*. Secondly, *high product quality* is in turn *determined by high raw material quality, possession of advanced technology and know-how*, and *competent management and staff*, indicating an emphasis on an objective concept of quality. Actually, the triangle *high product quality – possession of advanced technology and know-how – competent management and staff* seems to be the core of this diagram, indicating a strong emphasis on technological skills and objective product quality.

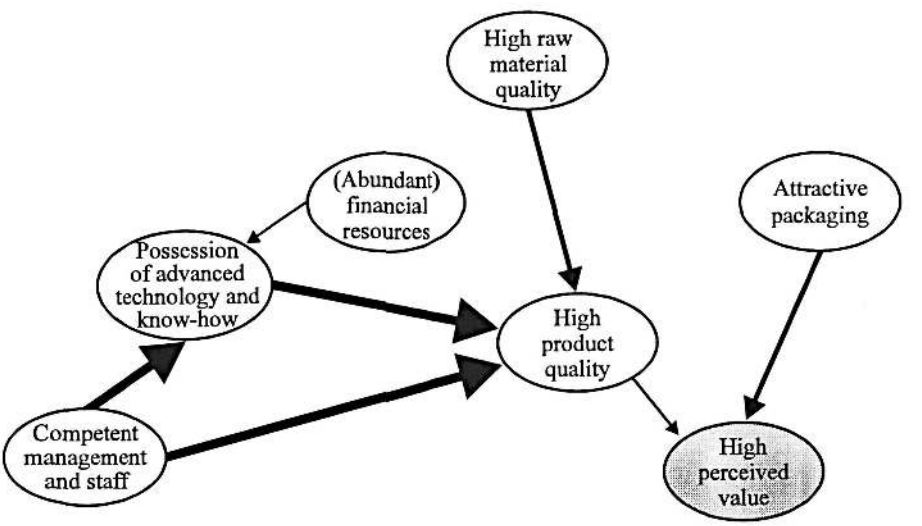


Figure 2: Major perceived determinants of high perceived customer value in the European yoghurt market (from Sørensen & Grunert, 1996)

How 'correct' are managers perceptions of success factors? When trying to compare managers' perceived key success factors with 'actual' key success factors, the

appropriate approach would be to get objective measurements of the extent to which companies or business units possess the various skills and resources in Figure 2, supplement this by objective measurements of customer perceived value, and carry out the appropriate statistical procedures for finding out which variables explain how much variance. The problem is, of course, in the 'objective measurements.' All the variables involved must be classified as latent constructs, something which is not immediately observable, but must be inferred on the basis of indicators. Subjective ratings by business executives are usually the only resort in a situation like this. Such measures are widely used, e.g., in the PIMS data base and give way to many possibilities for measurement error (Grunert, 1990; Phillips, 1981; Venkatraman & Grant, 1986). However, Parasuraman and Varadarajan (1988) have shown that PIMS data are astonishingly robust, and Dess and Robinson (1984) have documented reasonably high correlations between self-reported objective measures and subjective ratings.

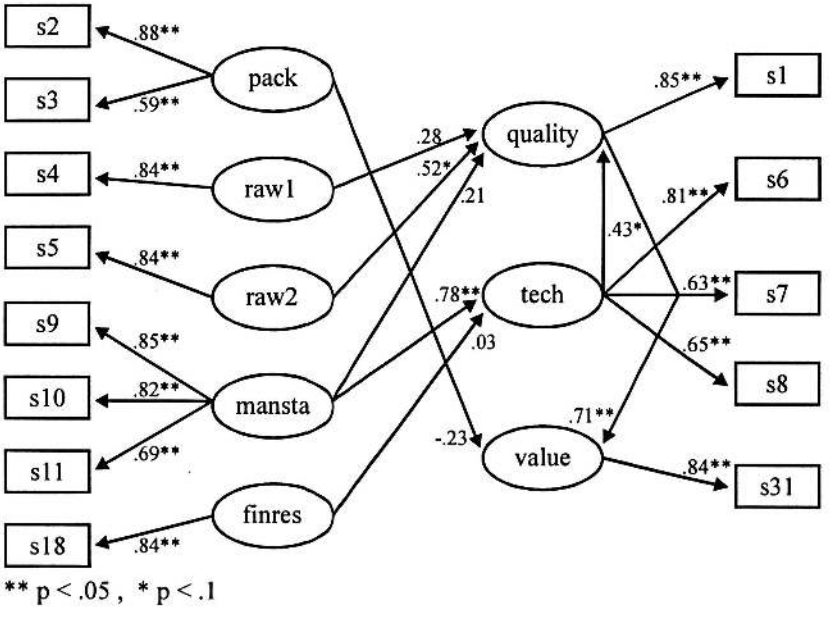


Figure 3: Structural equations model of determinants of high perceived customer value in the European yoghurt market (from Sørensen & Grunert, 1996)

Figure 3 shows the result of testing a structural equation model corresponding to the links in Figure 2, but based on other data – the same decision-makers' ratings of the performance of their own company and that of two competitors with regard to the various skills and resources and with regard to consumer perceived value of the products. Such data, where causal relationships are inferred statistically and not spelled out be the respondent himself, can be said to have a higher degree of objectivity than the data which Figure 2 is based on. When comparing the two sets

of results, the determinant *attractive packaging* turned out to be insignificant, contradicting the perception of the decision-makers as expressed in the implication matrices. *High product quality*, however, is significant, as is the link from *competent management and staff* to possession *of advanced technology and know-how*, and the links from there to *high product quality*, as well as from *high raw material quality* to *high product quality*, are weakly significant. By and large, the results therefore confirm the perceptions of success factors which were expressed in the implication matrices with two interesting modifications: packaging has no effect, and of the two raw material variables, it is not the milk quality variable, but the *variable quality of other ingredients*, which has an effect.

3.3. Future research

These studies are quite recent and encounter numerous methodological and theoretical problems, offering several avenues of research. Especially researching 'actual' success factors is an area with considerable potential for methodological improvement, namely when attempts are made to undertake such measurements on an intra-industry basis. In PIMS-type, cross-industry studies, the prospect of using large samples makes it easier to construct reliable measurement devices. For intra-industry studies, however, small sample sizes are probably more typical, which calls for new, innovative measurement devices which combine the advantages of multiple measurement with the constraints of small numbers. Also, the methodologies for measuring perceived key success factors are open for development, given the cumbersomeness of many current causal mapping techniques. Finally, such research also raises a number of interesting theoretical questions. Which factors facilitate the correct perception of success factors? How stable are the causal relationships, and how does the stability affect decision-makers' perception? To which extent are differences in business performance actually attributable to varying degrees of 'correctness' in perceiving success factors?

4. Market-oriented product development

4.1. General research on success factors in product development

The study of the perception of success factors deals with the channelling of market knowledge into business decisions and competence development at a very aggregate level. At the more specific level, new product development is probably the decision-making area where the interface between market knowledge and business competencies is most crucial for company performance.

During the latest decades a large body of empirical research has focused on identifying the success factors of product innovation (for more comprehensive summaries of the research area see, e.g., Craig & Hart, 1992; Harmsen, 1992; Hauschildt, 1993; Schewe, 1991). What these studies have in common is the underlying assumption that a number of identifiable factors influence or determine new product performance as well as an ultimate aim of normative prescription

regarding product innovation activities. The view is thus management-oriented, assuming that knowledge about causal relations regarding new product performance can be used to improve future product innovation either by prescribing specific activities or identifying non-controllable factors that can be used as screening criteria at an early stage in the development process.

These studies differ widely in methodology. Some studies aim at identifying the entire set of success factors including both internal and external factors as well as controllable and non-controllable factors. Others focus on one specific issue or success factor and try to determine its influence on project performance. Another aspect is the type of new product under investigation. There are various definitions of what a new products is and these are employed more or less explicitly in new product studies. The problem seems to be that some of the success factors vary for different types of new products. Both qualitative and quantitative approaches have been used, with qualitative approaches primarily being used for exploratory case studies or longer term studies of specific change processes (Barclay, 1992; Workman, 1993) and quantitative approaches being used for confirmatory or correlation studies. Populations chosen also differ widely. Examples of populations include companies in specific industries (Nyström & Edvardsson, 1982; Sneep, 1994), cross-sectional studies (Cooper, 1979, 1990) or studies with a number of companies or industries that share certain characteristics, e.g., innovative versus non innovative (Johne, 1984), high-tech versus non-high-tech (Karakaya & Kobu, 1994).

Despite the methodological fragmentation, it is commonly agreed that the results show quite a clear picture and that the identified success factors are consistent across a large number of studies.

Lilien and Yoon (1989) state that "the findings of these studies are often similar and consistent" and Cooper (1990) concludes that "the results remain remarkably consistent across studies, regardless of the study's context." Craig and Hart (1992) point out that "on the whole the findings from the studies, ranging over a period of almost 30 years, are very similar". Even though the list of factors influencing new product performance is long, they can be condensed to a number of overall success factors or main themes of new product success. Barclay (1992) identifies the following overall success factors, under which he groups specific results: open-minded and professional management, good market knowledge and strategy, a unique and superior product that meets customer wants and needs, good communication and co-ordination, and finally proficiency in technological activities. Craig and Hart (1992) arrived at a number of themes upon an examination of previous studies: management, process, company characteristics, people, strategy, and information.

If further simplification is called for, one can group the factors into three categories: product development strategy, market focus, and organisation of product development (Harmsen, 1996).

A number of the identified success factors regarding top management involvement and longer term considerations can be classified as factors concerning *product development strategies*. An example of this is forming a clear strategy – resulting in a focused approach to product development, and strategically recognising the importance of product development – resulting in a supportive climate for product development. More specifically, studies have shown that there are more successful projects where:

- an explicit product development strategy defines the types of products to be developed,
- the product development strategy is part of the overall strategy of the company and where the specific strategy is close to existing strengths or activities,
- the product development strategy takes market-related and technological considerations equally into account,
- top management motivates the understanding of the need for new product development,
- top management actively supports the development teams.

Practically all studies identify critical factors regarding market focus. In short, the emphasis on market focus builds on an assumption that the success of a new product is determined in the market by the customers' perception of the new product. It is therefore crucial to build the understanding of the customers' needs and wants into the process in order to improve the chances of success.

A number of studies identify market orientation factors at a very aggregate level, leaving little normative guidance. Examples include: attention to marketing, proficiency in marketing, marketing activities, launch of activities, and understanding customer or market needs. More specific success factors, which can be grouped under the label "market focus", are the degree of product superiority (identified from the customers point of view), the amount/frequency of contact with the market/customers during development, the degree of up-front marketing, presence of the marketing function in the development process, the amount of market/competitor knowledge, the use of advanced market research techniques, test-marketing, and prototype testing with customers.

Two different kinds of factors can be found in the category *organisation of product development*. First, several specific organisational arrangements, like, e.g., cross-functional team-work or the existence of a project leader, have been shown to correlate with success. Secondly, a number of empirically identified new product success determinants related to, e.g., the new product itself or market factors, can be dealt with through implementing organisational tools like project screening systems.

In other words, the success factors identified in this category cover both independent factors and activities, methods or organisational arrangements that support success factors found in the other categories.

Normative advice on the organisation of new product development activities shows a great degree of agreement across earlier studies, especially on the identification of the most appropriate organisational structures and management support systems for different kinds of development activities, while results concerning "softer" factors like management style, values and group communication are more vague. Within this area specifically the following factors correlate with success:

- co-operation between/co-ordination of R&D and marketing,
- the use of temporary multi-functional groups (as opposed to sequential processes with the involvement of the different functional departments at different times),
- clear goal setting,
- a participative management style; the project manager defines clear goals and sets apart time to solve conflicts,
- loose structuring in the initiating phases (idea generation, screening, concept development and concept test),
- product development as a learning process,
- more formalisation in the implementation phases (e.g., formalised development process, standardised control procedures),
- emphasis on up-front activities (initial screening, initial market assessment, initial technical assessment),
- formalised product development process (with a description of activities and control procedures),
- emphasis on accomplishing all phases and activities in the process.

4.2. Implementing the success factors in food and agriculture and future research

There is a considerable body of research with remarkably consistent results on success factors in new product development. While more studies with explicit focus on the food industry would be desirable, this does not seem to be the major unmet research need. Rather, the results of these studies are strikingly plausible and almost self-evident. Don't food companies implement this new knowledge? Why do we find that often food companies' actual product development behaviour deviates notably from the normative recommendations (Harmsen, 1994)? Studies looking at the issues of implementation of such results seem to be what is really wanting. A first action research study carried out recently (Harmsen, 1996) gave a number of hints with regard to a theory of organisational learning in the area of new product development. More research of that nature, both qualitative and quantitative, could be of considerable practical as well as scientific interest.

5. Retail decision-making

5.1. General approaches to buyer-seller relations and retail decision-making

We now move to research about the actors in the food chain located after the producer, i.e., the producer's customers. Usually a food company has at least two types of customers, one direct and one indirect: retailers and consumers.

A food manufacturer's success depends on his/her ability to develop products which are attractive to both retailers and consumers. Since failure is more the rule than the exception, however, knowledge of the retailer's buying behaviour, choice criteria, and listing criteria is invaluable to the manufacturer. A growing number of manufacturers are becoming aware of the importance of close relations to retailers, which is reflected in a growing interest in such topics as trade marketing and key account management. In the future, most food sales will be concentrated in even fewer retail systems, which in turn will be characterised by even more centralised decision-making. This, together with excess production capacity, will lead to innovativeness, and a readiness to adapt to changes in retailer needs, becoming key success factors. To meet these challenges, companies will need more and better information on retailer needs and requirements.

The relationship between selling and buying organisations has been the subject of increased research attention in the, 1980s, with several theoretical approaches being employed, in particular transaction cost theory and network theory. Seller-buyer, or supplier-customer, relationships have been conceptualised within various approaches to the studies of distribution systems, with the "dyad", the "transaction", and the "network" as the main units of analysis. While the concepts and terminology used by these approaches are remarkably different, the new approaches also have a lot in common. This was shown by Wilke (1994) in a comparative analysis of the *organisation assessment perspective* (Van de Ven & Ferry, 1980), the political economy model of distribution channel functioning (Reve, 1980), the political economy framework (Stern & Reve, 1980), and the interaction model (Håkansson, 1982). In particular, Wilke examines the variables/factors and causal relationships used by the various authors to explain inter-organisational relations, and highlights the considerable similarity in concepts and hypotheses. Resource-dependence is seen as a necessary, but not sufficient, precondition for co-ordination. In general, the development of inter-organisational relations, including conflicts and efficiency, is seen as a function of the degree of participants' awareness of the counterpart's needs and competencies. Awareness and a degree of consensus are also necessary. Among other things, it is generally assumed that a high degree of goal compatibility results in a high degree of co-ordination (interaction, centralisation and formalisation in Reve's terminology). Domain consensus is seen as both an explanatory factor and a precondition of the establishment of inter-organisational relationships. Several authors also stress the complexity of the environment as an explanation of the degree of formalisation.

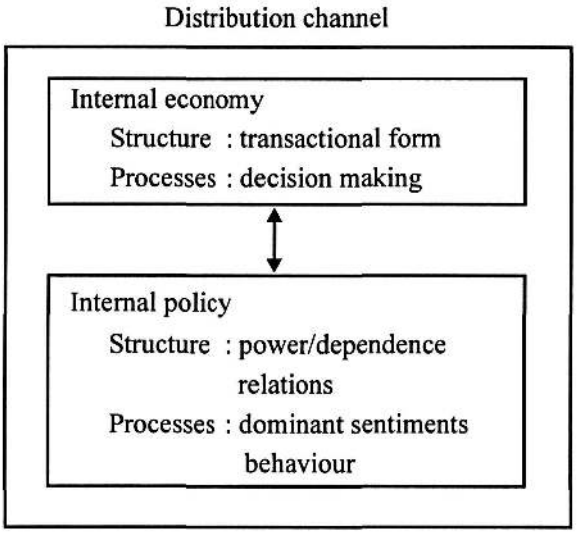


Figure 4: A model of channel relationships (adapted from Stern & Reve, 1980)

As an example, Reve (1980) focuses on the consequences of different vertical dyadic inter-organisational forms, while Stern and Reve (1980) focus on dyadic relations between organisations at different levels in the vertical distribution channel (Figure 4). Their aim is to integrate the microeconomic perspective on channels with a behavioural perspective, the former being efficiency-oriented (costs, channel design) and the latter power- and conflict-oriented. In Stern and Reve's conceptualisation it is presumed that there is a relation between the type of co-ordination used and the way decisions are made. Thus, in hierarchic marketing systems, decision processes can be expected to be highly centralised, whereas in conventional marketing systems, they can be expected to be highly influenced by price. It is also assumed that, the more balanced the power dependence pattern, the higher the degree of co-operation.

These theoretical approaches are quite general and focus more on relationships on industrial markets than on producer-retailer relationships. Likewise, the analysis of decision-making processes in retailing chains at the micro level, e.g., decisions on buying and listing new products, is an under-researched area. While consumer decision-making has been widely researched and industrial buying behaviour has received increasing research attention, the few studies of retailer decision-making that have been carried out have mostly been based on models of industrial buying behaviour (e.g. Sheth, 1981). A genuine theory of retailer decision-making is still conspicuous by its absence. Given the recent changes in the retail structure of many countries, this lack is even more critical. On the other hand, as many of the retail groups get larger, it is reasonable to assume that their decision-making processes become more centralised and professional, little resembling the decision-making processes of the single independent retailer. If this assumption is correct, then

industrial decision-making models could also be used to describe retailers' decision-making processes.

Research on retailer decision-making should be able to answer questions like the following ones:

- What is the influence of the overall channel structure on retailers' decision-making/buying behaviour?
- How is the purchase process organised, and how product-specific is it (especially with respect to listing criteria)?
- What determines retailer interest in establishing long-term relationships with suppliers?
- To what extent is it necessary to incorporate retailers' needs in the process of developing new products, and at what stage/phase should retailers be contacted?
- What determines the role of the retailer in the product development process?
- Do chains/retail systems differ with regard to attitudes towards participation in product development?
- Who initiates innovations?
- How does the retailer's product strategy (own labels) influence his willingness to participate in the manufacturer's development of new brands?

5.2. Research on retail decision-making in food and agriculture

We have conducted some preliminary, qualitative research which can shed light on some of these questions for specific case examples (Baadsgaard et al, 1993, 1994). The first study, which was on purchasing behaviour with regard to beef, was carried out in four markets – the United Kingdom, France, Germany and Spain. Among other things, it was found that the decision-making process for beef is highly centralised in the United Kingdom and Germany, while there can be as many as three levels: the central, regional, and local level in France. In Spain, the decision-making process of some retail groups is totally centralised, whereas in others it is totally decentralised, i.e. at the store levels. There were some differences between countries with regard to choice criteria/selection criteria. In the United Kingdom, retailers have a "buy British" attitude. At the same time, they are convinced that British beef is superior to foreign beef. Resistance to imported beef is also profound in France, though for a different reason: French retail groups are afraid how local farmers will react. Neither German nor Spanish groups share these attitudes. Otherwise, selection criteria are similar across countries as well as retail groups, and stress quality: products which are not injurious to health, and products which are produced, processed, stored and transported hygienically. The interest in specifying production standards differs among retail groups. The UK groups themselves control all steps from the farmer to the stores, and specify down to

detail. The German and French groups are only interested in controlling and specifying standards from the point of slaughtering. At the other extreme, the Spanish retail groups mostly rely on their domestic slaughterhouses to control quality. UK retailers avoid any processing in their stores, whereas this is very common in German, French and Spanish retailer groups. Relations between British, German and Spanish retail groups and their beef suppliers are very close, have lasted for many years (typically 20-30 years), and build on trust. The French retail groups are more opportunistic, and are always on the lookout for good offers. In addition, the French groups use their power vis-à-vis their suppliers to a larger extent than other retail groups. Apart from some Spanish retailers, none of the retail groups in the study are interested in collaborating with suppliers/manufacturers on marketing activities.

The second study was carried out on purchasing behaviour with regard to ecological dairy products in Germany. The main results are similar to those of the first study: a highly centralised decision-making process, a strong emphasis on quality, the requirement of control systems, the importance of punctual and secure delivery systems. Two major differences are worth noting, though. First, the retail groups required that the ecological products must be branded, i.e., display the brand of the manufacturer in question. Second, the retail groups required merchandising and marketing support from the manufacturer in the form of promotion material, in-store taste offers, education/instruction of the retailers' staff, and the possibility of test marketing in a few, selected stores.

5.3. Future research

Studies such as these raise interesting research issues in terms of both methodology and theory. With regard to methodology, techniques for data collection at the retail level are in their infancy. It is difficult to motivate retail purchasers to co-operate and it is difficult to get hold of them. The validity of the information obtained from them has never been investigated. Interesting theoretical questions refer to differences in the decision-making process between manufacturer and retailer brands, the development of models for group decisions, the applicability of classic compensatory decision-making models at the individual level, and the integration of purchasing models with new product development models from an interactive dyadic perspective.

6. Consumer quality perception and decision-making

6.1. Approaches to analysing consumer behaviour

There is certainly no scarcity of consumer research. Few areas in marketing have received more research attention in the recent decades. What may be lacking is the integration of various models and approaches with regard to their applicability in company decision-making, e.g., in the area of new product development.

Within the behaviourally-oriented analysis of consumer food choice, several broad approaches can be distinguished. In the *economics of information approach* Nelson (1970, 1974) contributed the distinction between *search goods*, where the quality can be evaluated before the purchase, and *experience goods*, where the quality can be evaluated only after the purchase. In the latter case, consumers will try to infer the quality from surrogate indicators like a brand name with an established record of credibility or the market share of the product. Nelson's argument was later extended in two ways. Firstly, it was pointed out that most goods have aspects of both search and experience goods, and that it makes more sense to apply a multidimensional notion of quality which includes both search and experience characteristics (Wilde, 1980). Secondly, it was pointed out that there may be a third group of characteristics where it is never possible, not even after the purchase, to find out whether the product actually does possess the characteristic. Whether a vegetable has been ecologically produced, or whether a piece of meat was produced with due respect for animal welfare, are product characteristics which are not reflected in objective characteristics of the final product; they may be either impossible to verify due to a lack of tracing possibilities or may be verifiable only at prohibitive costs to the consumer (Andersen, 1994). These characteristics have been termed credence characteristics, because it is a question of the seller's credibility vis-à-vis the buyer (Andersen, 1994; Darby & Kani, 1973). Similar to the economics of information approach, *multi-attribute approaches* share the assumption that quality is a multi-dimensional phenomenon. Also here, overall quality is described by a set of characteristics (attributes). These need not be objective characteristics, however, but they are attributes perceived by the buyer. The buyer then forms an overall, one-dimensional quality evaluation by weighing the various attributes. To some extent, the distinction between search, experience and credence characteristics has been incorporated into multi-attribute models by the distinction of intrinsic and extrinsic product attributes (Olson & Jacoby, 1972). Intrinsic attributes refer to attributes of the physical product, whereas extrinsic attributes refer to everything else. Extrinsic attributes, which include brand name, price, and sales outlet, etc., are expected to be used mainly in those situations where information about intrinsic attributes is difficult to obtain, i.e., in the choice situations characterised by a predominance of experience and/or credence characteristics.

Multi-attribute models have been the most widely used approach to analysing quality judgements in consumer behaviour, but they have also been widely criticised (e.g., Grunert, 1989). One point of criticism is that the interrelationship of attributes is not taken into account: consumers may infer taste from price or wholesomeness from fat content; all of these are treated as attributes at the same level by multi-attribute models. This criticism is dealt with in a group of models we call *hierarchical models*. They have in common the notion that consumers infer some attribute from others. This notion is central in *means-end chain theory* (Gutman, 1982, 1991; Olson, 1989; Olson & Reynolds, 1983; Zeithaml, 1988). A means-end chain is a model of consumers' cognitive structures depicting how concrete product characteristics are linked to self-relevant consequences. More specifically, the MEC

shows how a product characteristic (concrete or abstract) is linked to consequences (functional or psychosocial) of consumption, which in turn may be linked to the attainment of life values (instrumental or terminal). As an example, the concrete product characteristic *low fat* is linked to the abstract product characteristic *fewer calories*, linked to the consequences *slimming* (functional) and *social acceptance* (psychosocial), which leads to the values *self-confidence* (instrumental) and *self-esteem* (terminal). The major deficiency of these approaches is that, while the process of attribute inferral is adequately modelled, the final quality evaluation often remains foggy.

6.2. Analysing consumer behaviour in the food area

Consumers' evaluation of food quality is one of the more problematic areas in the study of consumer behaviour. Food products are described by a large number of characteristics, but the degree of satisfaction obtained from consuming the product is many times only loosely related to the cues available in the purchase situation. This is because the evaluation of central quality aspects, like taste, presupposes the destruction of the product, because many times the product is not consumed as such but is further processed by cooking and combining several products into meals, and because many food products, like meat, are predominantly sold unbranded, removing a major quality cue consumers otherwise can rely on.

There have been a few attempts to integrate the various approaches mentioned into a unified framework for analysing the quality perception process for food products, the most notable cases being the work by Steenkamp (1989) and Andersen (1994). Both models assume that those qualities sought in a food product by a consumer are always experience and credence qualities. Consumers use search characteristics only as indicators for the qualities actually sought, and these indicators are both attributes of the product itself and other (e.g., firm-specific) attributes. Based on these observable indicators, the consumer forms expectations about experience and credence qualities, which in turn are aggregated into an overall expected one-dimensional quality. The expected quality may then later be compared to the experienced quality, which will give rise to adjustments in the way future quality evaluations may be made. Grunert et al. (1995) have built further on these approaches and developed the *Total Food Quality Model*, depicted in Figure 5. One additional aspect in their model refers to the determinants of experienced as opposed to expected quality. Those product characteristics used as quality indicators by the consumer in order to infer expected quality may also impact on experienced quality, and not necessarily as expected by the consumer expects. In addition, experienced quality will be influenced by product characteristics not used by the consumer in his/her quality evaluation process, and by the way the product is used in meal preparation. Related to this, a second additional aspect refers to the technical product specifications which will determine both the intrinsic quality cues the consumer can perceive and the quality finally experienced. A third additional aspect refers to the sensory characteristics of the product, which Grunert et al. regard as

important mediators between technical product specifications, meal preparation, and experienced quality. Fourthly, the consumer's expected quality evaluation by itself, while important, will determine the consumer's intention to buy only in relation to the perceived costs associated with the product, where costs can be both financial and other costs. Price can be both a cost cue and an extrinsic quality cue. Finally, Grunert et al. go beyond quality and look at consumer's purchase motives, extending the means-end chain line of thinking.

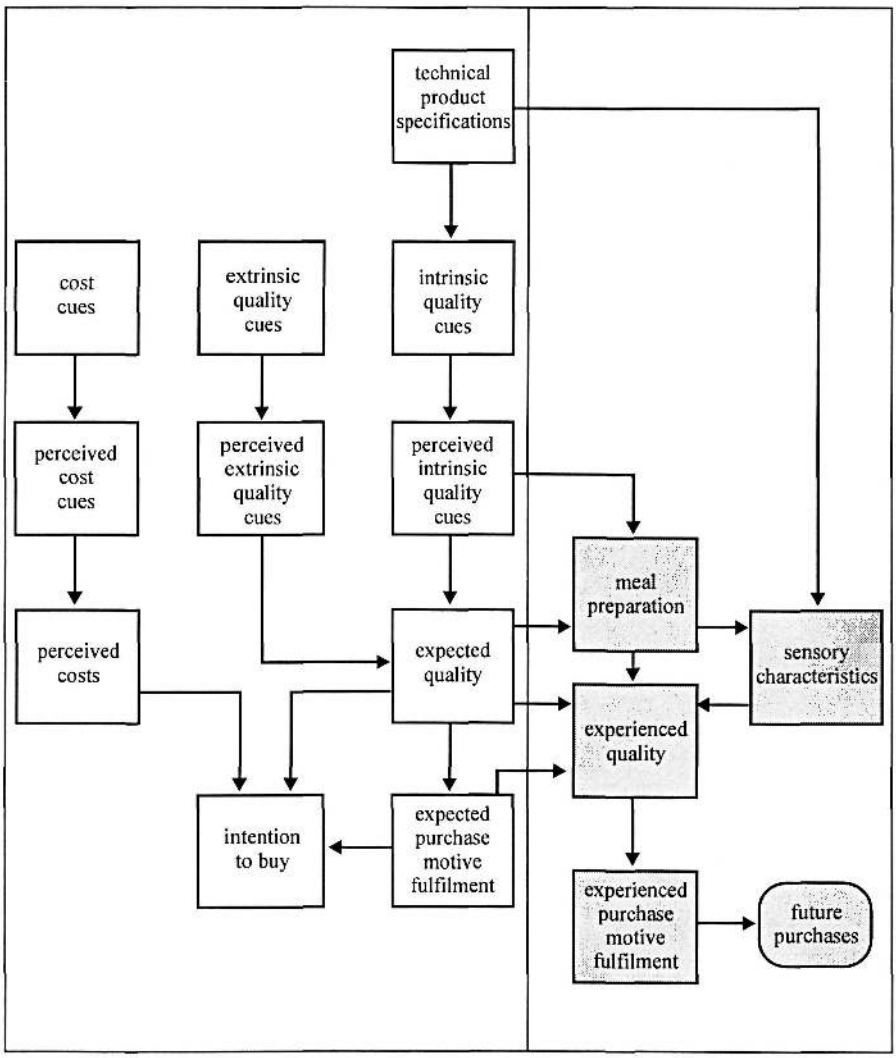


Figure 5: The Total Food Quality Model (from Grunert et al, 1996)

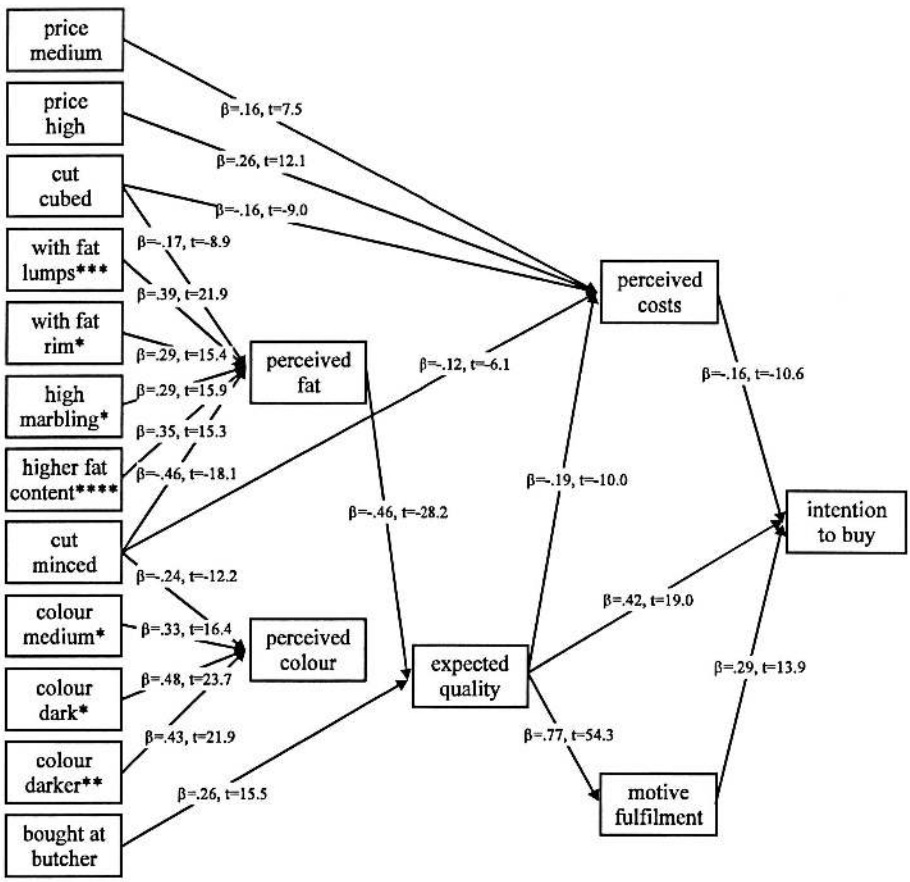
Two studies have reported empirical research capturing main aspects of the Total Food Quality Model. One study explicitly employing a hierarchical approach and dealing with the relationship between expected and experienced quality is the one by Steenkamp and Van Trijp (in press). They had consumers rate various steak cuts on nine intrinsic quality cues, later reduced to three underlying factors, and related these both to a number of technical product specifications and to an overall judgement of expected quality. Consumers also had the opportunity to sample the meat and rate it on a number of quality aspects, which were related to a global measure of experienced quality. Also these quality aspects were related to the technical product specifications. Results showed that the technical product specifications related to expected quality were quite different from those relating to experienced quality, and that the correlation between expected and experienced quality was not very high. This study captures several basic features of the Total Food Quality Model, namely the distinction between expected and experienced quality, the distinction between quality cues and quality aspects, and the relation to technical product specifications.

The other study (Grunert, in press) was aimed at estimating the whole left-hand section (except *technical specifications*) of the Total Food Quality Model, i.e., the *before purchase* part. It was designed to shed more light on how both intrinsic and extrinsic quality cues and cost cues are perceived and used to infer expected quality and purchase motive fulfilment, and how this affects purchase intention. Substantially, the insights gained were informative with regard to the development of product and communication strategies in the beef sector. Methodologically, it was the first attempt at a quantitative estimation of the Total Food Quality Model and broke new ground in the application of hierarchical models to the analysis of quality perception of food. Also, the study employed a cross-cultural approach, taking care of the fact that food, more than most other consumer products, has considerable cultural significance (Askegaard & Madsen, 1995; Fischler, 1990; Mennell et al., 1992).

Figure 6 shows the results of estimating a structural equation model based on data using an extended conjoint analysis procedure. It is based on data from three countries: Germany, Spain, and the United Kingdom. It is not a complete description of the quality perception process, but it shows the elements that seem to be common to the respondents in these three countries.

We see perceived fat, together with buying at a butcher's, as the main determinants of expected quality. We also see that, while the perception of colour is quite stable across the three groups of respondents, there is no cross-culturally uniform effect of perceived colour on quality perception. As it turns out, dark colour has positive effects in Germany, whereas light colour has positive effects in Spain and the United Kingdom. Perceived costs are formed as a compromise between various give and get components, i.e., price, cut, and expected quality. Intention to buy is affected by

both perceived costs and expected quality, the latter both directly and via expected purchase motive fulfilment.



* for steak and roast ** for cubed and minced *** for steak, roast and cubed **** for minced

Fit measures:

χ^2=1148.04, df=252, p=.000, RMSEA=0.039, p(RMSEA<.05)=1.00, GFI=.95, RMR=.12

Figure 6: A cross-cultural model of the quality perception of beef (common core of quality perception in Germany, Spain, United Kingdom, pooled estimates, standardised coefficients, all coefficients significant at the .05 level) (from Grunert, 1996)

6.3. Future research

These two studies are first attempts at a more integrative treatment of the various elements of consumer quality perception and decision-making processes in the food area. Especially the integration of before-purchase considerations and after-purchase

behaviour holds lots of potential for future research. The same goes for the integration of technical specifications and sensory characteristics, integrating the now quite isolated areas of sensory analysis and Quality Function Deployment into mainstream consumer research. In addition, some scientific evidence of the applicability and usefulness of such techniques in the area of new product development would be very welcome.

7. Market-oriented research in agricultural and food marketing

Most researchers in the marketing area agree on the importance of market orientation of companies. Not everybody, however, agrees on the importance of market orientation in conducting marketing research. Research in agricultural and food marketing, like all other research, should contribute to the generation of knowledge and therefore live up to the standards of scientific excellence. At the same time, however, our research should also live up to the standards of practical usefulness. Research contributing to better market orientation of food companies is research which itself is market-oriented, taking into account the decision-making needs and limitations prevalent in food companies. A few of such research areas, which we regard as promising, have been outlined in this paper.

Notes

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COMPETING FOR THE FUTURE IN THE AGRICULTURAL AND FOOD CHANNEL 2

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"We are standing on the verge, and for some it will be the precipice, of a revolution as profound as that which gave birth to modern industry. It will be the environmental revolution, the genetic revolution, the materials revolution, the digital revolution, and, most of all, the information revolution"

(Hamel and Prahalad, 1994)

1. Introduction

As in many other sectors, major changes are taking place in all parts of agribusiness. On the *demand side* consumers play the leading part. Consumers are changing their life styles, eating habits, shopping preferences, and attitudes. The consumer wants tasty products that: have built-in convenience; come in small portions; offer a lot of variation; meet ever higher health, safety, and animal welfare standards; and can be bought at places and times that suit her, and increasingly him, best.

In the *distribution channel* the traditional heavyweights of the sector – that is, the manufacturers of branded consumer products – are struggling hard to defend their positions. Retailing chains are becoming very large, and increasingly they capitalize on their position close to the consumer, using information technology to increase their knowledge of and strengthen their ties with customers and to streamline their logistic operations. At this moment they constitute a powerful force in the food channel.

As far as the *agricultural producers* are concerned, one observes an ongoing decrease in the numbers of farming and horticultural enterprises, with a corresponding increase in the size of the remaining firms. The agricultural enterprises of tomorrow are much more specialized and capital-intensive than their predecessors. They have to operate under conditions of ever tighter government regulations with respect to food additives, pesticides, herbicides, fertilizer, and manure use.

In the *larger environment* we see a political attitude of decreasing support for agriculture. Protection from national governments is diminishing, and the long-term objective of the European Union seems to be that agriculture, like any other economic activity, should be able to compete in the world markets. Furthermore, the agricultural and food markets are becoming more international. Firms in this sector already compete directly with their colleagues in the other countries of the European Union. Gradually, the competitive arena will be enlarged with the addition of Central and Eastern European countries, and for many products future competition will take place at a global level.

The topic of this paper is how companies in the agribusiness can compete for their future under the circumstances just described. Which competitive strategies should they follow, which type of products and production processes should they choose, which competitive advantages should they go after, and – very important – which links should they enter into with other parties in the channel?

With "companies in the agribusiness," we mean any firm in the agricultural and food channel, from the original agricultural producer to the retailing firm that delivers the products to the final consumer. In dealing with this topic we take a *future-oriented* approach. Many competitive analyses concentrate on extant markets

and the current positions of the various parties in those markets. However, in a time of rapid change, the rules of competition for tomorrow may well be different from today's rules. New circumstances will create new opportunities. It is important that a company seizes the advantages that these opportunities offer. In a dynamic perspective *"opportunity share"* is more relevant than *"market share"* (Hamel and Prahalad, 1994, 32). A company not only has to be *prepared* for the industry structure of tomorrow, it must also try to *create* this industry structure. The relative competitive strengths of the participants in the markets of tomorrow may be quite different from today. This holds true not only for individual firms, but also at the country level: one nation's firms supplant another's in international competition when they are in a better position to perceive or respond to changes (Porter, 1990).

2. Plan for the paper

We start with a discussion of the changes in the environment of the agricultural and food sector, paying particular attention to *Information Technology* (IT) as the most conspicuous of the factors driving the changes in the food channel today. Our second perspective is the interrelationships between the firms in the food channel, recognizing the different types of (marketing) relationships that can exist between the members of a chain, ranging from the (periodical) negotiation of transactions to integrated networks and complete vertical integration, and introducing the concept of *Agrifood Value-Adding Partnerships* (AVAP), which is the proper unit of analysis for studying competition in this domain. Third, we consider *competitive strategies* and the future *sources of competitive advantage* in the agribusiness sector, distinguishing between low order and high order competitive advantages. We will also deal with the sources of competitive advantages of agribusiness in a particular country. Finally, we discuss some of the *research questions* that follow from the approach taken in the paper. A more comprehensive framework than marketing management is needed in agricultural marketing, one which goes beyond the marketing mix optimization of the individual firm and encompasses the management of its relationships with other organisations.

2.1. Information Technology

We have referred already to changes in consumer behaviour as the main driving force behind the dynamics in the agrifood channel. Consumers eat smaller quantities, have less time available for buying, preparation, and consumption, demand lighter and healthier food, want opportunities for variation and a convenient supply. Moreover, in this postmodern time, demand becomes more fragmented with specific segments (sometimes very small) asking for specific products. Also consumers become more varied and less predictable: the same consumer can demonstrate very different types of buying behaviour at different times.

Information Technology makes it possible to monitor this capricious consumer directly and translate his/her behaviour into policies and actions for the delivering stages of the food channel. The first opportunity to observe consumer behaviour is

at the check-out of the supermarket, i.e., the point-of-sale (POS). The scanning revolution has now advanced to the point that in many Western countries the majority of supermarkets have scanning devices which register sales continuously. Although these devices were installed primarily to process customers more efficiently, they have now been recognized as important sources of information. Retailers who have the first access to checkout data increasingly use these "Frontline Information Systems" (Sheth and Sisioda, 1995) as a basis for marketing decisions. With these data, a retailer can exactly compute his profits or losses on specific product categories, using concepts such as Direct Product Profitability (DPP), Direct Product Costs (DPC) and Customer Account Profitability (CAP). Recently Albert Heijn, the largest Dutch supermarket retailer, discovered in this way that its product categories of beer, soft drinks, dairy products, bread, bake off, flowers and plants were "megalosers"[2]. This immediately prompted a critical analysis of its supply chain for these products.

Retailers are setting up delivery schemes with their suppliers based on POS data. A very sophisticated system is in place at the American retailer Wal-Mart with 2700 shops all over the USA. The 2500 suppliers of Wal-Mart have direct access to the POS information for their products and can deliver directly when needed. They are themselves responsible for the availability of their products on the Wal-Mart shelves. Wal-Mart expects from its suppliers frequent delivery and delivery in less than 24 hours. To demonstrate their commitment to their client, Procter & Gamble moved 12 managers from their own headquarters to the Wal-Mart offices to make sure that the their diapers and other products move smoothly and efficiently to the Wal-Mart shelves (Ing and Mitchell, 1994). The Dutch retailer Albert Heijn has set up the "Vandaag Voor Morgen" (Today for Tomorrow) scheme, an agreement with six manufacturers that they will deliver directly to the Albert Heijn supermarkets, six days a week, within 18 hours after receiving the order. Orders are transmitted through Electronic Data Interchange (EDI). Also, for fresh products such as meat and vegetables, there are direct (EDI) contacts with suppliers, sometimes as often as six times a day[3].

Recently the Food Marketing Institute of the USA introduced the concept of "Efficent Consumer Response (ECR)" (FMI, 1993; Van der Laan, 1994; Lagerweij, 1996). It has met with a lot of interest, especially among practitioners[4]. The purpose of ECR is to increase the efficiency and effectiveness of the entire food chain by the integration of marketing and logistic decisions and optimal coordination between the different links throughout the chain. The ultimate goal is to maximize consumer satisfaction by a maximally performing chain (Corstjens and Corstjens, 1995; Buxbaum, 1995). In Europe this concept has also been called Supplier-Retailer-Collaboration (SRC). It has been estimated that the application of ECR in the USA can save as much as $30 billion US (Van der Laan, 1994; Molpus, 1994).

The elements of ECR are Category Management, Efficient Replenishment, Efficient Promotions, and Efficient Product Introductions. We elaborate on the first two

elements here. Category management is the process that involves managing product categories as business units. Each category of products in a supermarket, for example, vegetables or meat, is treated as a profit center (Nielsen, 1992). Albert Heijn has thirty five different category managers, each of whom is responsible for a category of products. Smaller and less-sophisticated retailers cannot afford all these category specialists. Brand manufacturers try to set up partnerships with retailers and act as their category manager for the products they are specialists in, e.g., soup or coffee.

Efficient Replenishment has the purpose of bringing the right product at the right time to the right place in the most efficient way. Instruments for Efficient Replenishment are: barcoding, scanning, automatic reordering, EDI, crossdocking (direct delivery to the store instead of the distribution center), and Activity Based Costing. The result should be Just-in-Time delivery and paperless order and transportation systems (see Figure1). The Wal-Mart and Albert Heijn examples given before are efficient replenishment systems.

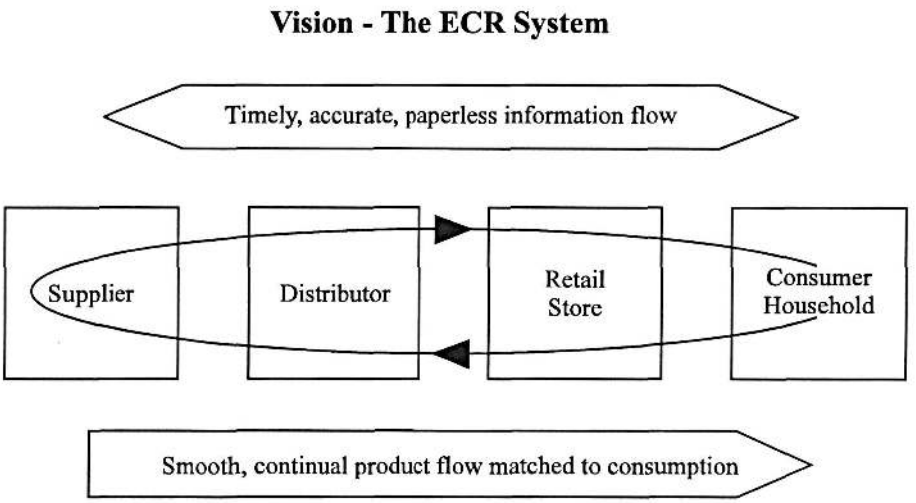

Figure 1: The efficient consumer response system (FMI, 1993)

The next step in this development is when retailers are not satisfied with the POS information anymore (which does not provide information about which customer bought what) and introduce so-called customer cards. Through customer cards a retailer can identify his clients, follow their buying patterns, and, if so desired, communicate with them directly (database marketing). For consumers these cards offer the advantage of discounts on specific products, and can be used for saving purposes and to make payments easy (chipcard).

It is likely that we are only observing the beginning of the effect of IT on the food channel. The following developments should be mentioned.

- IT will not be limited to linking the consumer to the supermarket or the supermarket to its suppliers of the final stage. The chain of electronic links will move backwards into the agrifood channel and ultimately reach the primary agricultural enterprises. In some cases that has already happened. This makes possible throughout the chain an optimal coordination of decisions with respect to: types of products to be grown, produced and processed; production and processing methods; qualities and quantities to be produced; and the timing of production and delivery. In this time of critical consumers, sourcing has become a major factor and it is important to know where products come from and how they have been produced and processed.
- The information highway may well have a major effect in the food channel. Although there is a lot of hype around the subject, marketers should closely follow the developments in this area. The Internet, as it has evolved over the last two years, gives us an idea of what is possible, marketing-wise, with such a medium. At this moment 35 million Americans have access to the Internet already. In Europe the number of Internet users is growing exponentially. The Internet may create a entirely new way of shopping, where a consumer uses the net to obtain information about the products available, to order what he wants, and to make his payments through this medium. It is possible to create "virtual stores" on the Internet. The software is already available. In Harvard's Marketing Simulation Lab a consumer can travel through a virtual store and view shelves stocked with virtually any kind of product. The shopper can pick up a package from the shelf (by clicking it on the monitor) and rotate it to see its different sides (Burke, 1995). These developments will give rise to a new breed of marketing called Net-Based Marketing (NBM), which will be cost-effective, individualized, and interactive (Sheth and Sisodia, 1995). In February 1996 Wal-Mart and Microsoft announced the system called Wal-Mart Online that makes it possible to shop electronically in the largest retail-enterprise of the USA.
- IT will make it possible to deal with the increasing fragmentation in consumer behaviour by enabling suppliers to deliver tailormade baskets of food to specific customer segments. In the future, customers who want organic, ecological, or biodynamic products, or food that has been produced under specific animal welfare conditions, can be traced easily through their customer card or their Internet connection. Through the information systems that go backward into the channel, their needs can be transmitted directly to the enterprises that produce the type of food they prefer. Also through IT, even retail stores belonging to the same (horizontal) chain can adapt their offerings to local preferences.
- In a somewhat longer perspective, IT might very well change the competitive scene in the food channel. We have referred already to the changing power

balance between manufacturers and retailers. The emergence of electronic markets for food, where consumers order and pay through Internet, will offer new opportunities to companies that go into the business of customer service and home delivery. Such a "supermarket-of-the-future" will need different physical facilities, a different IT infrastructure, staff with different skills, and a different location. The successful supermarkets in today's circumstances are not necessarily also the winners of tomorrow. For clever entrepreneurs there may be opportunities to create a new competitive infrastructure in the food channel.

2.2. Agrifood Value-Adding Partnerships (AVAP)

2.2.1. Need for vertical coordination

Through the contributions of the Functional School it has been recognized in marketing that each enterprise has to perform specific functions within the whole of the processing and distribution process between the primary producer and the final consumer (Alderson, 1957). This idea has been made more explicit in Porter's concepts (1985) of value added chain and value system. A specific company's value chain consists of all those activities that contribute to buyer value, such as production, marketing, delivery, service, and their supporting activities (for example, procurement and technology development). A company's value chain in a particular industry is embedded in a larger stream of activities that together form the value system. The value system includes suppliers as well as the companies in the different stages of the distribution channel and includes the ultimate buyer (for an illustration, see Figure 2).

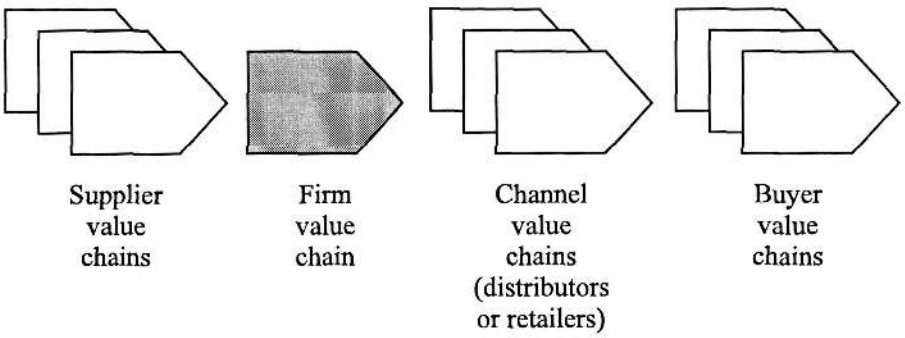

Figure 2: The value system (Porter, 1990)

A firm can survive only if it can add so much value between its supplying side and its delivery side that the market is willing to pay enough to cover the costs incurred in creating this value. The value system always exists, whether or not a firm in the system realizes that it is part of this value system. Historically in the agrifood

channel the participants in the different stages have tended to behave in an autonomous way. Part of the reason for that is the structure of the channel: it is made up of many relatively small firms. Parties in the different stages of the channel often demonstrated adversary rather than cooperative behaviour towards each other. It is increasingly recognized now, however, that the overall performance of the agrifood channel can improve significantly through coordination and partnerships between the participants. All participants can benefit from the better performance of the channel. The need for cooperation has grown because of the higher demands from consumers and retailers, which as we have just seen, requires the linking of companies in the different stages of the channel. Also the primary agricultural enterprises, which have become much more specialized and capital-intensive than their predecessors, are in need of establishing enduring links with partners upward in the channel. They have to be assured of profitable destinations for the products for which they make heavy investments in production facilities. This development is enhanced by the decreasing price support for agricultural products from the (European) government. In the last section we have seen that IT is providing the enabling technology for more vertical coordination in the agrifood channel. As a result of these developments we will move from a situation of relative autonomy of the participants towards more coordination, long-term relationships, partnerships, and strategic alliances in the agrifood channel.

Strategic partnerships occur not only in the agrifood channel, where they replace traditional market-based transactions. On the contrary, much more has been written about partnerships in the industrial domain (Best, 1990; Axelson and Eaton, 1992; Anderson and Narus, 1990; Ford, 1990; Hakansson and Johanson, 1993). It is interesting to note that partnerships in this latter domain tend to come from the opposite direction: they replace large bureaucratic hierarchical organisations (Williamson, 1975; Webster, 1992). For example, large traditional hierarchical corporations in the automobile industry transform themselves into smaller, more flexible organisations that enter into all kind of partnerships with designers, suppliers and service providers.

2.2.2. A hierachy of marketing relationships

Following Webster (1992) we can distinguish several types of marketing relationships that can be put in a continuum from pure transactions to fully integrated hierarchical firms (see Figure 3).

A pure transaction is a one-time exchange of value between parties with no prior or subsequent interaction. Repeated transactions can be considered as the precursor of a relationship. The rudiments of trust and credibility are present. Under long-term relationships there are long term contracts, but still the relationship is often at arm's-length and adversarial, where in contract negotiations the customer is fighting against the vendor in a battle focused on low price. Buyer-Seller partnerships emerged first in the American automobile industry applying the lessons that they had learned from their Japanese colleagues. In a buyer-seller partnership the focus is

away from the individual sale (the transaction as conquest) and toward an understanding of the need to develop long-term mutually supportive relationships. In some cases the partnership between a supplier and its customer takes the form of an entirely new venture, a true strategic alliance. In this case the partners want to achieve some long-term strategic goal. If a strategic alliance leads to the creation of a new firm with its own capital structure we speak of a joint venture.

Figure 3: The range of marketing relationships (adapted from Webster, 1992)

Whereas alliances are confined to individual agreements between partners, a network encompasses a larger set of partners. It is a kind of confederation, a loose and flexible coalition guided from a hub where the key functions of the network – management and development of the network, coordination of financial resources and technology, relationships with clients, etc. – are performed. Of course the most

extreme type of relationship is the vertical integration of suppliers and buyers in the same corporation. In that case the market between the entities has disappeared. This arrangement of the various activities in one hierarchically organized corporation has become less popular recently. Networks are preferred instead, in which each part of the process or function is the responsibility of a specialized independent entity, efficiently organized, that has world class competence. Even IBM has reinvented itself as a network organisation (Webster, 1992).

2.2.3. Definition of AVAP

This network/chain approach is very relevant for firms in the agrifood channel. Competing for the future in this channel means searching for the right partnerships: those partners on the supply and demand side that produce the best fit with one's own competences and will lead to the best synergetic results. This implies that, for the study of competition between companies in the agrifood channel, the unit of analysis should be the "value-delivering system" rather than the individual firm.

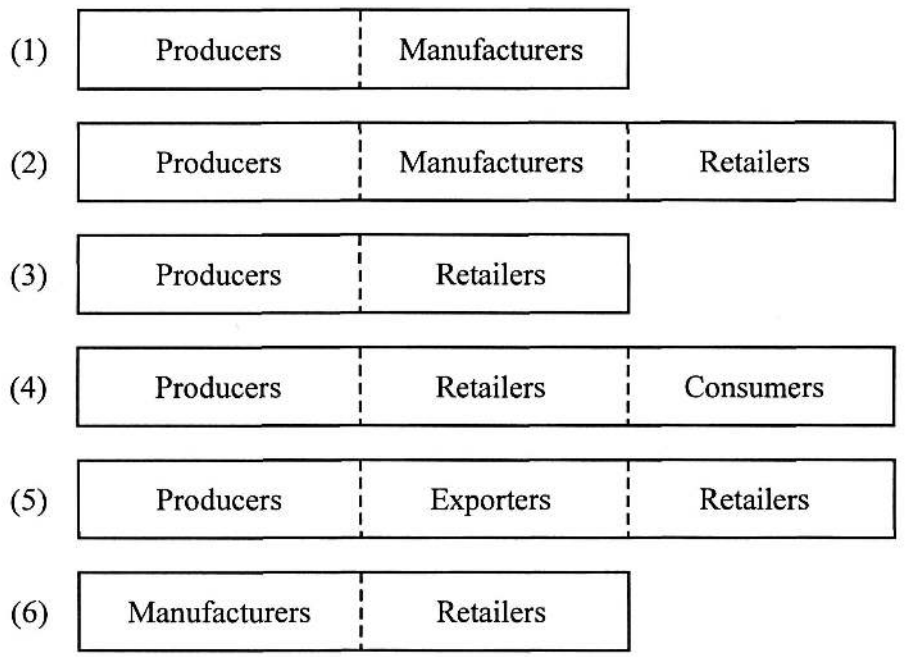

Figure 4: Examples of Agrifood Value-Adding Partnership (AVAP) covering different stretches of the agrifood channel

Johnston and Lawrence (1988) define a "Value-Adding Partnership" as a set of inter-dependent companies that work closely together to manage the flow of goods and services along the value-added chain. Inspired by their formulation we define an Agrifood Value-Adding Partnerships (AVAP) as:

> *a set of interdependent companies that work closely together to manage the flow of goods and services along the value-added chain of agricultural and food products, in order to realize superior customer value at the lowest possible costs.*

AVAPs can be different in length and cover different stretches of the agrifood channel. As the definition implies, AVAPs have the purpose to increase effectiveness as well as efficiency. In Figure 4 several examples are given: (1) an AVAP can be limited to a collaboration of (agricultural) producers and manufacturers that deals on a transaction basis with companies in the following stage of the channel; (2) another type is a tripartite partnership between producers, manufacturers and retailers – such a partnership might be appropriate for ready-to-eat meals; (3) producers can also cooperate directly with retailers, for example, in the case of fresh vegetables; (4) another arrangement is a partnership of producers, retailers and consumers, which can be found in the area of biodynamic/organic food; (5) as national borders are increasingly transgressed, partnerships between producers, exporters, and (foreign) retailers would be appropriate for horticultural products; and (6) AVAPs do not necessarily have to start at the level of agricultural producers – partnerships are possible that encompass manufacturers and retailers only.
At any point in time different AVAPs can be distinguished that exist "alongside" each other (and can compete with each other) in the same agrifood channel. For example, consider the picture of the present distribution channel for Dutch vegetables in Figure 5.

For fresh vegetables Agrifood Value-Adding Parnerships might be set up between growers and retailers in Holland, between growers, exporters and foreign (German) retailers, or between growers, the processing industry, and retailers. And within each of these categories there might be different AVAPs which position themselves differently. Some might cater to the high (quality) end of the market, while others might go for large volume. There are examples of very successful AVAPs already. In the beef production sector of Northern Ireland, four (originally competing) meat factories have set up a partnership in conjunction with primary agricultural enterprises which breed and fatten the animals. The "production technology" was developed over a period of 40 years. There are strict rules with respect to feeding (mainly grass, which gives the product a green image) and animal welfare. The meat produced by this AVAP and marketed under the brand name "Greenfields" had a strong competitive position on the French as well as the Dutch market (until the "mad cow desease"). In the latter country the AVAP, originally between producers and manufacturers, was extended to include a large retailer that sells Greenfields meat exclusively in its supermarkets. All parties involved –the primary agricultural producers, the meat factories, and the retailers – can benefit from such partnerships.

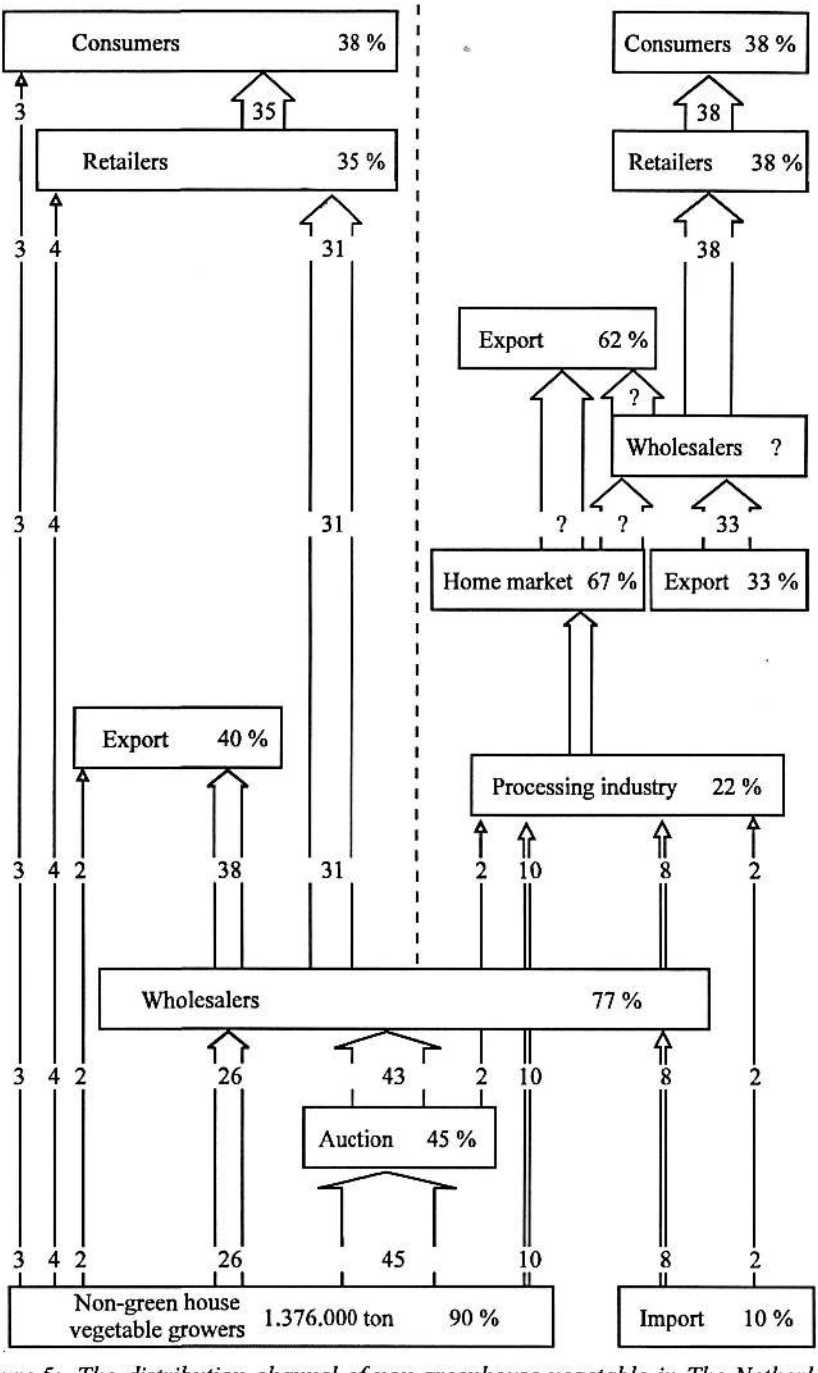

Figure 5: The distribution channel of non-greenhouse vegetable in The Netherlands (Adapted from Janssen, 1994)

As already observed, different AVAPs can compete with each other in the same agrifood channel. This implies that a particular farming enterprise linked to a specific AVAP can be more profitable than his neighbour who is linked to a different AVAP. Of course, apart from AVAPs there may remain a "transaction-based chain," formed by companies that want to maintain their autonomy with respect to production, purchasing, and selling decisions and deal with other parties in the channel on the basis of (ad-hoc) transactions.

2.3. *Strategies and sources of competitive advantage*

A basic strategic question of any enterprise (not only in the agrifood channel) is: how can I adopt a position in the value-added system so that, at least in the long run, my value-added is higher (and hopefully a lot higher) than my costs? An important issue in this context is the question of the "core competences" of an enterprise: that is, the bundle of skills and technologies a company is really good at (Hamel and Prahalad, 1994). For example, one agricultural firm might be very good at plant climate conditions and disease control, another at machinery and logistics, a third at price negotiations with suppliers. A company should try to realize its value-added through its core competences. Also depending on the core competences should be the choice of external parties to deal with (suppliers, buyers), the decision whether or not to enter into Agrifood Value-Adding Partnerships (AVAP), and the choice of a particular AVAP. The new competition is no longer between individual competitors, but between the relative effectiveness of competing value-delivering systems. The strength of the famous blue jeans maker Levi's is its strategic (and electronic) network with the companies in its delivery and supply chain: Sears (retail), Milliken (fabric), and Du Pont (fibers) (Kotler, 1994). The strategy of an individual firm should be consistent with the strategy of the AVAP it is linked to. The future success of companies in the agrifood channel will be very dependent on the AVAPs to which they belong.

An AVAP will have to determine its competitive strategy in order to survive and prosper. Most of the following discussion of competitive strategy and sources of competitive advantages in the agrifood sector refers to the level of the AVAP.

With respect to the positioning of a company (or an AVAP) within an industry, two important aspects can be distinguished: *competitive advantage* and *competitive scope* (Porter, 1990). With respect to competitive advantage, one can choose from two alternatives: *lower costs* or *differentiation.* Lower costs is the ability of a firm to design, produce, and market a comparable product more efficiently than its competitors. Differentiation on the other hand is the ability to provide unique and superior value to the buyer in terms of product quality, a strong brand or special features, or after-sale service. The second variable in Porter's model is *competitive scope*, which is the breadth of the firm's target within its industry. In nearly every industry there are multiple distribution channels and several different segments of customers. One can either choose a broad scope or focus on one or a few particular

segments. If we combine the variables competitive advantage and competitive scope, we arrive at a scheme with four different *generic strategies* (Figure 6).

		COMPETITIVE ADVANTAGE	
		Lower cost	Differentiation
COMPETITIVE SCOPE	Broad target	Cost leadership	Differentiation
	Narrow target	Cost focus	Focused differentiation

Figure 6: Generic strategies (Porter, 1990)

The *cost leadership* strategy aims at being the cheapest overall. An example of a market where this strategy seems to be popular is the butter market of the European Union where the selling prices are determined by government regulations. The *cost focus* strategy tries to realize the lowest costs in specific markets. For example, a specific AVAP might adopt the objective of delivering food products at lowest prices to the institutional market (hospitals, psychiatric institutions, barracks, etc.). The third strategy, *differentiation*, can be realized, for example, by having a strong brand. Companies like Unilever, Nestlé, and Danone follow that strategy with brands (e.g., Lipton, Nescafé, and Danone) that often transgress national borders (broad target). In the fourth generic strategy, *focused differentiation*, a company tries to differentiate itself in a more limited domain, such as a specific geographical area. For example, Dutch dairy companies tend to limit the use of their brands to their home market. Differentiation is not limited to production companies. Retail chains also use this strategy in developing consistent and distinguishing "retail formulas."

It is important that a company in the agrifood sector (or an AVAP) chooses a particular competitive strategy. It has to decide whether to aquire advantage by producing at low costs or by offering a premium, distinctive product to the market. Also it has to decide whether to approach the whole market (at home and abroad) or to focus on specific segments. The worst strategic error is to be *stuck in the middle*, a recipe for mediocracy and below-average performance (Porter, 1990, p. 40). A company can be successful and profitable with any of the above strategies. For example, it is not always necessary to differentiate oneself by a strong (consumer)

brand. If a company does not have the competence or the financial means to establish such a brand, it may be wise *not* to halfheartedly try some sort of (weak) brand, but instead form an AVAP with a retailer and, through an outstanding logistic performance, become a reliable, low cost supplier.

2.4. Sources of competitive advantage

The sources of competitive advantage of a company are directly related to its position in the value-added system. As we saw earlier, competitive advantage derives on one hand from the value a company offers to its buyers, and on the other hand from the cost incurred in delivering this value. A future-oriented company is always trying to *create advantage* to strengthen its perspectives on the long run. Perceiving or discovering new and better ways to compete in an industry is ultimately an act of *innovation* (Porter, 1990, p. 45). Broadly defined, innovation includes both improvements in technology and better methods or ways of doing things: product changes, process changes, new forms of distribution (e.g. Net-Based Marketing) and new ideas for approaching the market. Innovation can shift competitive advantage when rivals either fail to perceive the new way of competing or are unable to respond.

Porter distinguishes five most typical causes of innovation which are also very relevant for the agrifood sector:

- *New technologies.* Biotechnology and genetic engineering are creating new products and new production processes in the food domain. In the non-food domain, technologies are being developed to use agricultural products as raw material for industrial processes (e.g., natural fibres and starch-based packaging materials).
- *New or shifting buyer needs.* For food we see clear trends of stronger needs for safety, health, naturalness, variety, and built-in services.
- *The emergence of new industry segments.* An example in the agrifood sector is the emergence of a large group of elderly consumers, with their specific buying habits and needs.
- *Shifting input costs.* Rising input costs for some producers may create opportunities for others. For example, Spanish producers of tomatoes obtain competitive advantage *vis-à-vis* their colleagues in Holland as the latter pay more for for the natural gas they use in their greenhouses.
- *Changes in government regulations.* Adjustments of government regulations with respect to product standards, environmental controls, pesticides, and additives can result in competitive advantages for parties that are not affected or who have the technology to deal with the new situation (e.g., developing crop varieties with built-in anti-disease properties that do not need pesticides).

2.5. Determinants of national competitive advantage

In many countries the agricultural and food sector is an important part of the economy and it is interesting to consider the development of the competitive position of that sector in light of the changes that we see today. Our discussion will be guided by Figure 7, which is an adaptation and extension of Porter's famous "diamond" model.

The first determinant of national competitive advantage is *factor conditions.* This refers to human resources, physical resources, knowledge resources, capital resources, and infrastructure. A distinction can be made between basic factors and advanced factors. Basic factors include natural resources, climate, location, unskilled and skilled labour, and debt capital, whereas advanced factors include modern information technology (including a telecommunications infrastructure), highly educated personnel such as graduate engineers, and university research institutes in sophisticated disciplines. For many industrial products the importance of basic factors has been undermined by their diminished necessity (automation) and/or their widening availability through, for example, global sourcing. For agri-products this is also the case, but to a somewhat lesser extent since many agricultural products are both voluminous to transport and perishable. The latter factor is especially important in a time that consumers demand fresh products. So production locations close to the large population centres remain important.

For agrifood products the advanced factors are very important for future competition.

To be at the leading edge of the development and application of new bio-engineering methods can give companies a significant margin. The same is true for information technology. If a country has a an advanced computer and tele-communications infrastructure, it will be easy to connect the production and operations processes of companies in the different stages of the agrifood chain and design "Efficient Consumer Response" systems, in the home country as well as with partners in export countries. This will lead to high-quality channel performance and, consequently, a strong competitive position. It should be realized that factor advantage is a dynamic phenomenon. The standard for what constitutes an advanced factor rises continually, as the general state of knowledge and practice improves. So if you have advanced factor conditions today you cannot simply rest on your laurels: you can be overtaken by other countries.

The second determinant of national competitive advantage is *demand conditions.* Quality of home demand is more important than quantity. The home market does not necessarily have to be big but it is advantageous if home buyers pressure local firms to innovate. The basic orientation even of big exporting companies usually is the home market.

A product's fundamental or core design nearly always reflects home market needs. . . . A nation's firms gain competitive advantage if domestic buyers are the worldmost sophisticated for the products or services. Such buyers provide a window in the most advanced buyer needs (Porter, 1990, Chapter 3).

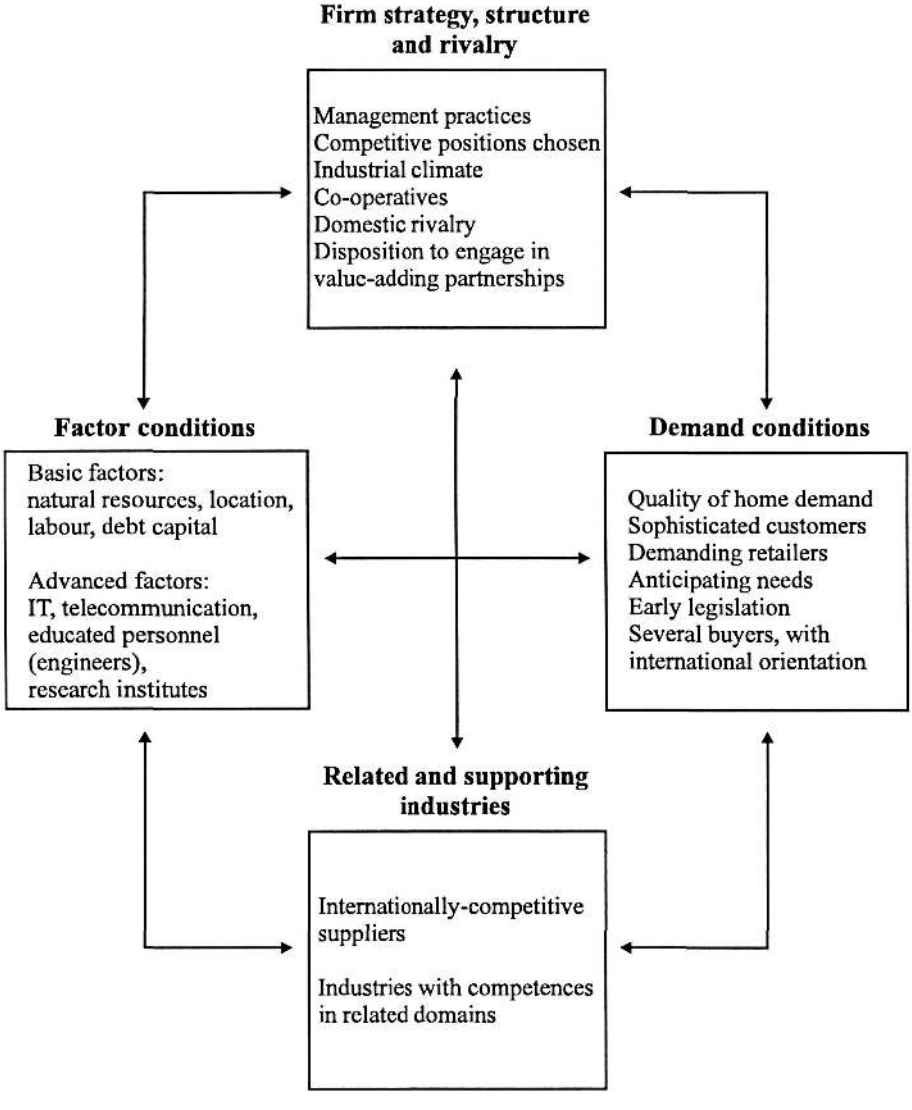

Figure 7: Determinants of competitive national advantage in the agrifood sector (adapted from Porter, 1990)

For example, Japanese producers of consumer electronics have benefitted from the knowledge and critical attitude of the Japanese consumer with respect to audio- and video-equipment and cameras. The German car industry has the advantage of customers who require very high standards from a car. Demanding buyers at home is also important for agricultural and food products. Unfortunately the Dutch eating culture is not particularly advanced. We do not have many restaurants that specialize in Dutch foods, like other countries have restaurants specializing in their food, and our home customers are not very demanding. This may be an explanation for the fact that, although Holland is a big exporter of food products, our export package has always been "middle-of-the-road," with few exquisite products. In general, we also cash an average price. In strategy terms this qualifies as a cost leader strategy, but it may also mean "stuck in the middle." Holland is a major cheese country in terms of quantities, but there again, probably due to a lack of demanding consumers at home, it has not been able to develop a range of top varieties. French consumers are known to be very sophisticated as far as food is concerned and this definitely has made their cheese, meat, wine, and other food products more delicious. For important Dutch export products like bulbs and cut flowers, however, the story might be different. Here Dutch buyers are most likely among the most sophisticated of the world.

It is advantageous if the needs in the home market *anticipate* those of other nations. In that respect German food producers have the advantage in that they can learn from their consumers who are relatively more conscious of health/purity/ naturalness, as compared to other countries. It is also possible to profit from early legislation in one's home country if that is to be followed by other countries afterwards: one can develop the necessary adaptations first. Considered that way, early legislation in a country with respect to environment protection, additives, pesticides, and animal welfare can be a "blessing in disguise" for the future competitive position of its agrifood sector. Finally, it is advantageous to have demanding retailers and several home buyers, preferably with an international orientation. From that perspective it is a positive factor to have large sophisticated international brand manufacturers such as Unilever, Nestlé, Grand Metropolitan, and Danone around.

The third determinant of national competitive advantage is *firm strategy, structure, and rivalry.* The chosen competitive position of firms, as well as their management practices and modes of organisation, can be quite different from country to country. Compare Germany with Italy, for example, two countries which are very different with respect to the products for which they have a competitive advantage. For the agrifood sector in particular, an important industrial climate factor is the attitude toward cooperatives. In some countries there is a strong tradition of primary producers to bundle their interests by creating cooperatives; in other countries this tendency has been much less strong.

Domestic rivalry is also an important factor in national competitive advantage. Although it is often argued that domestic competition is wasteful, one of the strongest empirical findings in Porter's research (1990, p. 117) is the association of vigorous domestic rivalry with the creation and persistence of competitive national advantage in an industry. This is true perhaps because domestic rivalry creates pressure on firms to improve and innovate, which in turn leads to stronger national competition. Nations with leading world positions often have a number of strong intra-country rivals, even in small countries such as Switzerland (pharmaceuticals) and Sweden (cars and trucks). Japan has very strong rivalry in one of its most internationally competitive industries: automobiles.

This influence of domestic rivalry on national competitive advantage also applies to firms in the agrifood sector. There have been many mergers in this sector, often between farmers' cooperatives within the same country. The argument has been made that, by obtaining economies of scale through a merger, the cooperatives obtain a strong position against the buyers in the agrifood channel. This can lead, however, to a situation characterized by adversary transaction-oriented negotiations instead of value-adding partnerships with the companies in the next stage of the channel. In the long run, an industry's competitive position is better served by the presence of several strong rivals in the home market who challenge each other to deliver superior performance to consumers. As far as AVAPs are concerned, the best situation is that at any time there are several different AVAPs in the same agrifood channel who compete for the customer as well as the supplier side.

In the context of this paper we add a specific factor to the diamond model in Figure 7: the *disposition of firms to engage in value-adding partnerships.* Since operating in coordinated chains can produce much better channel performance than when companies in the various stages of the channel act autonomously, it is important for the competitive position that firms are willing to make partnerships and networks. This is not always the case, because not every firm is prepared to give up a part of its self-determination, even if it will lead to evident gains in profit. There may well be elements of attitude here that are related to the national culture (Hofstede, 1991). One important factor could be trust. Japan clearly is a country where the concept of *keiretsu* (networks between firms) is blooming and has led to many successes.

Porter distinguishes in his diamond model a fourth determinant of national competitive advantage for an industry: *related and supporting industries.* Internationally-competitive suppliers can be very important for an industry, especially when there is a fast pace of development in production facilities and raw materials. For the agrifood sector, for example, this applies to climate-controlled greenhouses in horticulture and to breeding material for plant and animal production. The presence of a strong software industry is also important for the development of integrated logistic systems to deliver Efficient Consumer Response. The presence of world-standard engineering facilities improves the competitiveness of the sector. Also, the presence of so-called related industries can be advantageous.

For example, in Denmark both the dairy and the beer industry have benefitted from the presence of a strong industrial enzymes industry.

3. Conclusion and Research Agenda

3.1. How to compete for the future?

There is no general prescription for successful competition that applies to all firms in the agrifood channel. An individual company should start with defining its core competences and determine how it wants to create value and which sources of competitive advantage it wants to exploit. For different firms, i.e., with different competences, different strategies will be appropriate.

The agrifood channel traditionally has not been the stage where revolutions take place. Even if the pace of change in the agrifood sector is not as fast as in industries like computers and telecommunications, it is important to be pro-active and to take advantage of the opportunities that occur. Based on the developments discussed in this paper, the following opportunities present themselves (see Figure 8).

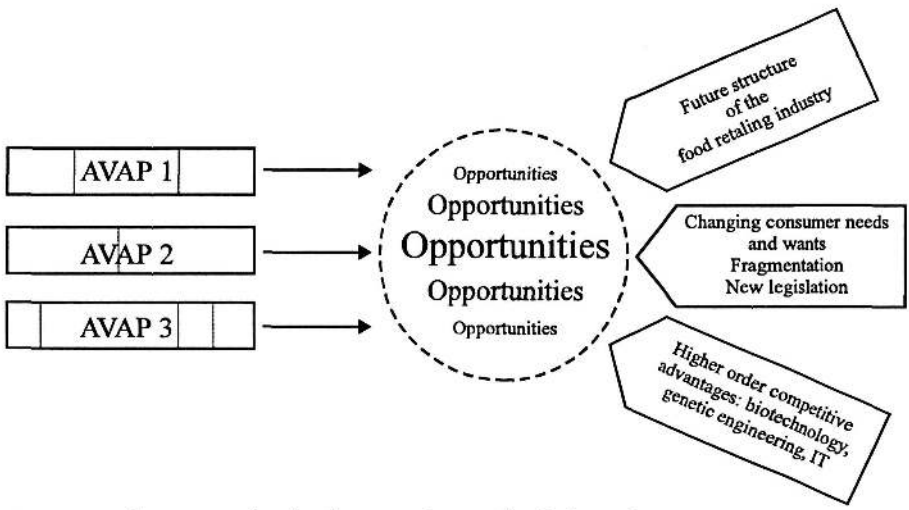

Figure 8: Competing for the future in the agrifood channel

- There is a tremendous opportunity to increase the competitiveness of the agrifood channel through the formation of Agrifood Value-Adding Partnerships (AVAP). This development is favoured by the desire of consumers to know the origins and production processes of the products they buy, by the need of retailers (and wholesalers) to increase the efficiency of the channel, and by the need of the primary producers to be assured of a

destination for their products. We have seen that IT delivers the enabling technology for such AVAPs, making it possible to link companies in the different stages of the chain together and to control production and processing over the full length of the chain (from primary producer to final consumer). This offers many opportunities, especially for suppliers of fresh products such as vegetables, dairy products, and meat. In the philosophy of Efficient Consumer Response, supermarkets need quick, reliable and efficient replenishment systems for these products. Another element of ECR, category management, may offer possibilities to create AVAPs with the ambition to become category manager for certain classes of fresh food in retail chains.

- Although in many countries the food retail scene is characterized by a dominance of a small number of large retail companies, we might see an increase in retail competition in the future. One reason is the emergence of new forms of retailing, for example, the growing importance of stores at gas stations and so-called seven-eleven shops. Also, the hours of operation of existing shops will increasingly become a competitive instrument. In a somewhat longer perspective, shopping through the electronic highway will also become important for food products and generate a new form of competition: Net Based Food Marketing. It is important to take advantage of future changes in the structure of the food retailing industry.

- The changing needs and wants of consumers offer opportunities for suppliers to react with creative policies of differentiation and segmentation. It is possible to develop specific products for consumers who want natural, low-fat or biological products, or products produced under specific conditions (e.g., with respect to animal welfare). Using IT it will be increasingly possible to deal with consumer fragmentation and to cater to specific segments. Restrictive legislation with respect to products and production processes (e.g., for health, safety, and energy reasons) may be disadvantageous for the present suppliers in the short run, but may well offer possibilities for new competitive advantages in the future.

- When so-called lower order competitive advantages disappear – for example, because of imports from Central European countries –companies in countries who have followed a cost leadership strategy will have to revise their orientation. They should try to profit from their higher order advantages and use their knowledge of biotechnology and genetic engineering to develop new products and improve production processes for existing products. Branding strategies will often be required to make this visible in the market place. An alternative route to differentiation in the market place is to use higher order advantages (IT) for the development of superior logistic systems and in this way become an attractive partner-supplier.

3.2. Research agenda

The focus of the research agenda should be Agrifood Value-Adding Partnerships (AVAPs) in their competitive environment. Conceptual as well as empirical work is needed .

3.3. Appearance and effectiveness of AVAPs

The first scientific task is to describe and classify AVAPs. To start with, the following attributes of AVAPs might be distinguished:

- strength of linkages in the AVAP (see Figure 3)
- levels of the channel present in the AVAP (see Figure 4)
- discipline: the extent to which the individual partners act in accordance with the common goal(s)
- flexibility, with respect to making use of new opportunities and allowing new partners
- locus of power, e.g. close to the consumer or close to the producer
- level of sophistication (e.g. with respect to IT)
- national or international
- competitive strategy adopted.

Conceptual models should be developed that relate the attributes of a AVAP, in combination with characteristics of its competitive environment, to its success in the market place. Empirical observations should be made of AVAPs that operate in practice, so that the conceptual models can be quantified and tested. This will provide insights with respect to the effects of specific variables and will help to find the critical success factors of AVAPs under different conditions.

3.4. Formation of AVAPs

Another interesting research question is: what are the forces behind the formation of AVAPs? How does a firm move along the continuum from transactions to long-term relationships to partnerships and alliances and perhaps back again (Webster, 1992), and how does the choice of partners take place?

The role of the existing institutional framework in a country – cooperatives, marketing boards, and farmers unions – should be taken into account in studying these phenomena, since such institutions could act as originators or catalysts for the development of AVAPs. However, some of their characteristics make it unlikely that this will happen on a large scale; in fact, the existing institutional structure may even hamper the development of the AVAPs that are needed for a strong competitive position in the future. Existing farmers' cooperatives have a long tradition of treating their members equally, but this may hinder making certain arrangements for subgroups of their members, such as Efficient Consumer Response Agreements with retailers, in which only members with advanced facilities and superior production processes can participate. Marketing boards practically always

imply some form of government involvement (Kohls and Uhl, 1990), which means that they also have to act in the interest of all producers.

Another drawback of cooperatives is that their locus of power (and perspective), even if they have integrated processing and distributing facilities, is close to primary production and far removed from the market. This does not make them very suitable to take the guiding role in an AVAP of which the very purpose is to derive competitive advantage from adding those values that consumers want. The same argument, perhaps even more forcefully, applies to the traditional farmers' unions.

However, one element that was a factor in the creation of cooperatives many years ago is also relevant for AVAPs. If many farmers are partners in an AVAP, together with only one or a few (large) partners from the other stages of the channel (processing or retailing companies, for example), there is the issue of countervailing power. The farmer-members may need a specific organisational arrangement to bundle their interests *vis-à-vis* the other partners. In other industries we see how such arrangements can be made in a satisfactory way. For example, for many years in retailing there have existed so-called "voluntary chains," partnerships between a small number (sometimes only one) of wholesale companies and many individual retailers. Several of these chains have been very successful and profitable for the retailers as well as the wholesalers. In some cases the arrangements of individual farmers with an AVAP might bear a similarity with a franchise-agreement.

For the study of AVAPs in their competitive environment, their appearance, their effectiveness, and the way they are formed, we need an expanded view of the marketing function within the firm that specially addresses the role of marketing in firms that go to market through multiple partnerships (Webster, 1992). Political economy can help us to understand the role of marketing in managing relationships with other organisations (Arnd, 1979, 1983; Meulenberg, 1986). Also, the extensive work in the area of networks between industrial organisations may provide inspiration and help for developing conceptual frameworks for the study of AVAPs (Nohria and Eccles, 1992; Ford, 1990; Hakansson, 1987; Mattson, 1987; Anderson, Hakansson and Johanson, 1994).

Notes

[1] Faculteit Bedrijfskunde/Rotterdam School of Management, Erasmus University Rotterdam, The Netherlands.

[2] *Foodmagazine* August 18 1995, p. 14.

[3] Interview with H. Bruijniks, *Tijdschrift voor Marketing*, Febr 1996, p. 47.

[4] See for example a series of articles in *Progressive Grocer*, January and April 1994.

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3 MARKETING ANALYSIS FOR AGRICULTURAL DEVELOPMENT: SUGGESTIONS FOR A NEW RESEARCH AGENDA[1]

Willem G. Janssen[2] and Aad van Tilburg[3]

1. Introduction

The performance of agricultural marketing systems in developing countries has often been poor and government intervention has not been very successful (World Bank, 1987). At the least we can formulate two hypotheses to explain the weak impact of many interventions in agricultural marketing by public authorities. The first hypothesis is that the methodologies applied in agricultural marketing analysis are not adequate or have not been applied with sufficient rigor, thereby leading to poor understanding of both the problems and opportunities and resulting in incorrect recommendations for change (Harriss, 1979). The second hypothesis is that public agricultural marketing research methodologies provide a correct view of the market *per se*, but have not been concerned enough with the interactions between marketing systems and agricultural development.

To support our hypotheses, we develop a framework that shows the linkages between the functioning of the marketing system and the development of agricultural and other sectors of the economy. This will, then, provide guidelines on how agricultural marketing analysis can contribute to improved agricultural development policies. To develop this framework, we ask and answer the following questions on agricultural marketing systems:

1. How is the development of agricultural marketing systems related to the development of other sectors of the economy?
2. From the analysis of the interactions between marketing systems and the rest of the economy, which concerns arise with traditional agricultural market assessment methodologies?
3. What type of alternative criteria and procedures may then be proposed for market assessment?

4. Which issues require special attention in market assessment procedures which link economic and market development?
5. How can marketing systems then be modeled to take into account the criteria, procedures and issues that are highlighted?
6. Which policy implications may be drawn from this new analysis?

2. Agricultural Marketing Systems and Agricultural Development

Agricultural marketing systems make a major contribution to development by facilitating the process of exchange. Exchange in agricultural marketing systems concerns the delivery of inputs, production factors, agricultural products, services, and information in return for value. The specialization permitted by the exchange process allows producers to increase their productivity, thereby reducing average unit costs. At the same time, the process of exchange widens the range of consumption possibilities to many people in society.

To optimally aid agricultural development, marketing systems should fulfill these exchange functions effectively and efficiently[4]. Effectiveness is defined as the extent to which marketing systems contribute to the attainment of goals as stated by society through its government representation. Effectiveness is a dynamic criterion because these goals and the environment of the marketing system may change. The marketing system must adapt to the changes in demand, supply and technological or socio-economic conditions which occur in the process of development. The modifications required when moving, for example, from a marketing system that clears the occasional surpluses of semi-subsistence peasants to a system that absorbs the supply of commercial farmers, may be large.

Efficiency is interpreted as a static criterion and requires that goals are attained with optimal use of resources. It reflects optimal costs of operating the marketing system. To define effectiveness in a dynamic context, a development perspective is needed, as defined by a country's development objectives. These objectives may be derived from a 5-year-plan, a strategic plan, a development policy, or by policy papers of non-governmental organisations. Increasingly, countries are stating their development objectives in their policies, also in response to the lending requirements set by international agencies. These plans should reflect the physical, ecological and economic conditions the country faces.

It does not make sense to outline any standard process of agricultural development. Nevertheless, at the risk of being too general, a discussion on the role of marketing in agricultural development benefits from a rough sketch of some ideotypic stages of market development. The following description reflects our ideas on how agricultural and food markets normally develop. We distinguish between five principal stages of development (see Table 1), described as primitive, emerging, intermediate, industrialized and advanced. Few countries are still in what we consider the primitive stage, with an almost exclusive subsistence orientation. Most

developing countries can be characterized as emerging or intermediate and some, such as, Mexico and Brazil, as industrialized developing economies. Also, it happens that a country which is intermediate in some characteristics, has some of the characteristics of a poor or industrialized country. Or that after a shock, such as, a political conflict, a previously intermediate country becomes an emerging one, but still has an agricultural marketing system with the characteristics of an intermediate country (e.g., Cordell, 1993). Because of their inability to control the economic, political and natural environment, many countries are developing as if they were walking the "Echternach" procession: three steps forward and one or two backwards after a natural disaster, political conflict or sudden change in the terms of trade. The result is that not one single country's development can be fully described by just one of the stages summarized in Table 1. The matter is not that the market system of any country fits into one of the stages, but that the stages are indicative of the possibilities of the development of agricultural market systems.

In the field of agricultural supply (Table 1A), we see a shift from subsistence to a mix between home consumption and a marketable surplus (market orientation), to a commercial orientation. Supply specialization tends to increase by eco-region and also by farm size and by market contracts. Market access improves throughout the process, also because more complex supply organisations (marketing boards, cooperatives) are founded. Agricultural input markets (Table 1B) change strongly in the process of development. For example, the characteristics of seed demand change from occasional replacement to a demand for varieties with specific commercial characteristics. In the process of development, the demand for differentiated agricultural products increases (Table 1C). Whereas a large segment of poor consumers may absorb the bulk of supply, the segment of relatively wealthy consumers may be more innovative, and thus, may offer more potential for change and be a good source of producer revenues. Finally, we review the market functions (Table 1D), often distinguished by physical, exchange and facilitating functions.

Among the physical market functions (e.g., Kohls and Downey,1972), spatial exchange is important in any stage of development, but the direction tends to change strongly. Seasonal control initially concerns only non-perishable staples, but may, in more advanced stages, be extended to perishables (Table 1D). In the later stages of development, the value added in processing and marketing tends to exceed that in agricultural production.

Transaction costs tend to fall in the process of development. Nevertheless, the price to the consumer does not normally fall. More value is added by processing, grading, sorting and improved quality management, implying that the advantage for the consumer is in improvement in quality rather than price reductions. Marketing channel coordination is usually absent at the lowest level of development, but is more dominant in agricultural marketing at the more advanced level. Among the facilitating functions, the need for working capital and control of price risk can be reduced by proper marketing and financial arrangements.

Table 1: Characteristics of agricultural marketing systems at different stages of development

A: Supply characteristics

	Development stage				
	Primitive	**Emerging**	**Intermediate**	**Industrialized**	**Advanced**
Producer orientation	Subsistence	Marketable surplus and subsistence	Production for sales and subsistence	Commercial	Commercial
Producer specialization	Absent	By ecoregion	By ecoregion and farm size	By ecoregion, farm size and market integration	By ecoregion, farm size and market integration
Small farm market access	Poor	Poor	Variable	Good	Very good
Large farm market access	Poor	Variable	Good	Very good	Very good
Supply organizations	None	Small local groups	Larger local groups	Marketing cooperatives	Agro-industries

B: Input markets characteristics

	Development stage				
	Primitive	**Emerging**	**Intermediate**	**Industrialized**	**Advanced**
Seed demand	Stock replacement	Stock replacement improved varieties	Stock replacement/ improved varieties	Improved varieties/ clean seed	Improved, commercial varieties/ clean seed
Fertilizer demand, food crops	Absent	Absent	Low	Medium	Medium
Fertilizer demand, export crops	Medium	High	High	High	Medium
Pesticide and machinery demand	Absent	Low	Medium	High	Medium-high
Process control demand	Absent	Absent	Absent	Low	High

Table 1: (Continued.)

C: Demand characteristics

	Development stage				
	Primitive	**Emerging**	**Intermediate**	**Industrialized**	**Advanced**
Required product differentiation	Very low	Low	Medium	High	Very high
Demand structure defined by:	Home production possibilities	Urban versus rural location	Income level	Income and household	Household size and preferences

D: Market function characteristics

	Development stage				
	Primitive	**Emerging**	**Intermediate**	**Industrialized**	**Advanced**
Spatial exchange	Intraregional	Intraregional Rural-urban	Intraregional Rural-urban Interregional	Intraregional Rural-urban Interregional	Rural-urban Interregional
Seasonality control	Absent	Absent	Non-perishables	Non-perishables, meat	Non-perishables, meat, dairy, fruits, vegetables
Arbitrage	Absent	Credit bound	Credit bound	Contracts	Contracts and future markets
Transaction costs	Very high	High	Medium	Low	Very low for products with high value added
Value added off-farm	Very low	Low	Medium	High	Exceeds product value
Market coordination	Absent	Export crops	Export crops/ High value food crops	Export crops/high value food crops	Dominant in most product categories

3. Concerns with Traditional Agricultural Market Assessment Methodologies

Markets are instrumental in achieving an efficient balance between demand and supply, but performance criteria should vary with the stage of development and should concern both short-run imbalances and long-run economic growth. Market assessment criteria should reflect both the effectiveness and efficiency

considerations which correspond with the stage of economic development. Economic theory suggests that a market equilibrium is optimal, if, in a perfectly competitive environment, supply and demand balance out at the point where the marginal value of consumption equals the marginal cost of production. Perfect competition is achieved if there are many suppliers and demanders who are not subject to entry barriers, all have perfect information, and all offer or want a homogeneous product. A perfectly competitive market is expected to lead to the maximum total contribution to producer and consumer welfare, since both parties face a price that they cannot influence and at which one party cannot achieve additional profits or utility without the other party loosing more than the first party wins (e.g. Just, Hueth and Schmitz, 1982).

Based on these equilibrium conditions, industrial organisation theory establishes criteria for efficient and equitable markets, such as, a sizable number of supply and demand agents; the inability of any actor to influence market conditions; relatively uniform supply; and transparent information and communication. Many of these criteria are part of structure-conduct-performance (SCP) analysis (e.g., Clodius and Mueller, 1961; Scherer and Ross, 1990). SCP analysis is often used as a tool in agricultural marketing analysis, both in developed and developing countries. Other approaches to market analysis, such as, transaction costs economics (Williamson, 1985), institutional economics (Eggertsson, 1990), or commodity system analysis (Shaffer, 1973) add insights into the factors that affect effectiveness and efficiency in agricultural markets.

Studies based on SCP analysis showed that the conditions for perfect competition were rarely met in reality. As a result, the standard for perfect competition has been replaced by standards such as, workable competition (Sosnick, 1958, 1968) or contestable markets (Baumol et al., 1988). Certain authors, such as, Smith (1972) argued that SCP analysis cannot easily be transferred from developed to developing countries because of differences in infrastructures and social and political conditions. Other authors (e.g., Harriss, 1993) argued that SCP-analysis has limited prediction power.

In addition, the collection of primary data on market structure, conduct and performance has often been substituted by a heavy reliance on the analysis of secondary data, especially price series. The analysis of market performance has often been limited to market efficiency analysis based on price integration parameters (e.g., Heytens 1986; Ravallion, 1986; Alderman, 1993).

The tools to measure market efficiency have also been criticized for methodological reasons (e.g., Sosnick, 1958; Harriss, 1979). Critique centers on the poorly defined interactions between the aims of the marketing system, the analysis of the marketing system, and the proposed remedies for a marketing system (Sosnick), and on the lack of rigor in the testing procedures and the econometric specifications (Harriss). This led to more specific and more robust models (e.g., Timmer, 1981; Faminow

and Benson,1990; Sexton et al., 1991; Lutz, Van Tilburg and Van der Kamp, 1995). SCP analysis may be sufficient to measure market efficiency and is very helpful to understand the reasons behind the particular performance of a marketing system (e.g., Lutz and Van Tilburg, 1993; Van Tilburg, Mulder and Van Dijken, 1992), but it is a partial analysis and not sufficient to assess the contribution of agricultural markets to economic development.

The first reason is that SCP analysis usually does not examine the costs and benefits of successful intervention. This reduces the usefulness of SCP criteria for policy purposes. For example, an analysis may show that the number of traders in the market is below the number required for full, workable or contestable competition, thereby allowing them to reap excess profits and cause reductions in supply. It is not clear however, which type of intervention to increase competition would be a good investment: Policy makers could remove entry barriers, for example, by making credit available to new potential traders, or by strengthening marketing institutions. To understand the impact of these alternative strategies at regional and national level, market analysis has to be integrated in a sector and often even macro-economic perspective.

The second reason is that SCP analysis normally does not include the process of change and instability through which most developing economies are passing. For example, in a market where the number of traders is below the number required for perfect, workable or contestable competition, profits above the normal rates of return may prevail. Thus the principal question is: Will these profits be invested? If so, in improvements in the marketing infrastructure, in facilitating services, or in building stronger entry barriers? If profits are invested in marketing infrastructure, they are expected to improve the market performance in the future (Schumpeter, 1944). If profits are saved, they may be used to improve the capitalization of trade, thereby helping the market agents to overcome years of poor supply.

The third reason is that SCP criteria may be useful to review the existing agricultural marketing systems but do not indicate very well their potential for causing change. However, the ability of the marketing system to foster economic growth and development should be a principle performance criterion. To pursue the example, traders may develop new markets or review the potential for new products, rather than concentrate on price competition in existing markets.

Industrial organisation theory suggests perfect, workable or contestable competition as a condition for adequate market functioning. But marketing channel theory suggests a certain extent of (horizontal and) vertical concentration as a condition for good performance. Stern and Ansary (1992) explain why coordinated marketing systems, where a central agent coordinates the market channel from supplier to consumer, are supposed to be superior to traditional marketing systems with many supply and demand agents at different levels in the marketing channel. Coordinated systems are assumed to achieve efficiency through better planning (e.g., Bucklin,

1966), quality control and channel leadership, thereby positively influencing channel performance. Economies of scale may be achieved. At the same time, there is the danger of bureaucratization and inflexibility of vertical marketing systems.

Apparently, it is difficult to unambiguously define the relation between market structure and market performance. It may be more fruitful to judge market performance in relation to both its economic environment and internal structure. In that case, marketing analysis should take into account the potential of the marketing system for long-run improvements and modifications. The implications are that: 1) market assessment criteria and the ideas about possible market interventions should be derived from overall economic or agricultural development objectives; 2) market assessment criteria should be specific to the development stage of the economy; 3) marketing analysis should center on identifying the areas where intervention in the marketing system is highly profitable from a national perspective. SCP analysis can be a good starting point for the analysis of marketing systems, but must be complemented by analytical approaches which take into account the development of the marketing system within the overall economy.

4. Proposed Market Assessment Criteria and Procedures

In general, product and factor markets should be in such a state that economic growth is "optimal" from the perspective of general welfare. Agricultural development goals as formulated by the governments of developing countries and/or their advisers (e.g., World Bank, non-governmental organisations) provide the principal indicators to measure whether markets have reached an optimal or satisfactory state (e.g., Janssen, 1986). The relative importance of these goals may vary from country to country, depending on stage of development and political preferences. Development goals may imply: acceptable producer income based on reasonable prices and a sizable volume of supply; access to a product (food) basket at moderate consumer prices; stability of income and food supply; employment creation; access to capital at reasonable prices; and a positive contribution of agriculture to the balance of payments.

Some of these criteria, such as, those for producer income and consumer prices or expenditures may appear to be conflicting goals. In the context of evaluating market interventions, producer income and consumer prices may improve simultaneously, for example, if post-harvest losses or transaction costs are being reduced. This is just the point where static, efficiency-oriented analysis and dynamic, effectiveness-oriented analysis diverge.

By applying the objective of economic development as a criterion for market assessment and market intervention, the focus of marketing analysis shifts from the market to its interactions with the economic environment. Application of such analysis benefits from a systems framework that clearly defines the agricultural marketing system with its possible competing marketing channels and the

interacting supply, demand and policy systems (e.g., Churchman, 1968). The analysis implicitly recognizes that the marketing system should evolve in interaction with the systems in its economic environment. This affects the way in which marketing systems are being evaluated. After an analysis of the characteristics of the marketing system, the evaluation should review how modifications of the system affect supply and demand, producer and consumer prices, employment and the balance of payments? To answer this, it is necessary to have a thorough understanding of the interactions between the marketing and production system, the marketing and consumption system and the resulting effects on employment, the balance of payment and price stability. This requires that the analysis move beyond the description of the commodity subsector and its market system.

Elbers (1992) studied the effects of improvements in rural and urban infrastructure on the marketing of agricultural products, incomes and prices in Nepal. For this purpose, he used a spatially disaggregated general equilibrium model[1]*. This model reflects the strong rural-urban (income) differences and the effects of improvements in regional and interregional transport on the Nepalese economy. The model provides a simultaneous equilibrium at regional and national level as well as in the transportation market.*

Elbers specified different regions (rural, urban, foreign), sectors (agricultural, manufacturing and services) and endogenous interregional freight flows. He assumed a hierarchy in the trade network: rural regions only trade with their urban counterparts, while urban regions may trade with all other urban regions. Five classes of goods were distinguished, including food and cash crops.

The integration of the rural economies in the national economy was blocked by high urban-rural transportation costs. A simulation with a 50% reduction in urban-rural transportation costs had some very interesting results. Production of agricultural commodities would increase considerably, thereby providing more rural income and employment. The urban sector would benefit through increased trade volumes and the resulting expansion in the marketing system, providing many opportunities for income and employment growth.

[1] *In this model: (1) one must specify the economic actors or agents whose behavior is to be analyzed, e.g. producers and households; (2) behavioral rules must be specified: to maximize profit or maximize utility; (3) agents make their decisions based on signals they observe, e.g. prices; (4) one must specify the "rules of the game" according to which the agents interact, e.g. perfect competition (Robinson 1989).*

Box 1: Agricultural marketing research in Nepal

The impact of specific, alternative interactions should be forecasted, in order to allow policy makers to choose the intervention which best suits their objectives. Policy simulation models play an important role in such analysis and a few examples are provided in Box 1 and 2. These policy simulation models may fit a broad range of specifications, but they should satisfy a number of basic criteria which we elaborate on at a further stage in this paper.

Janssen (1986) simulated developments for the cassava market in Colombia over a ten year period. A multilayer (e.g., producer, wholesaler, and retailer), multimarket (e.g., urban, rural, feed industries and other industries) model was developed to analyze the effect of growth in demand and changing marketing cost structures. Improved marketing technologies were compared with improved production technologies. The conclusion was that, contrary to general opinion, the introduction of marketing technologies had more chances of success and would carry larger benefits in terms of income and employment than the introduction of improved production technologies. Another conclusion was that investments in marketing structure would bias benefits towards the rural population, whereas investments in production structure would bias benefits towards the urban consumer. Seven years later, Janssen's findings have been largely validated by further studies on the actual development in Colombia's cassava sector (Gottret, Henry and Duque, 1993).

Piggot (1993) used an equilibrium displacement approach to evaluate alternative strategies for international wool trade. For Australia, he showed that an export monopoly does not lead to significantly more market control in most world markets. He studied extensively how results changed with different assumptions about the key parameters, such as supply and demand elasticities, and found that, for the feasible sets of parameters, the outcomes of the model were very stable. His conclusion was that abolishing the export monopoly would lead to reduction in trading costs thereby allowing a stronger position in export markets. Therefore, the study favored trade liberalization.

Box 2: The impact of market technology improvements or trade policies on agricultural growth

Thus, ideally policy- and development-oriented agricultural marketing analyses should take two analytical steps. *The first step* is the identification of key problems or opportunities for improvement, by means of studying satisfaction among producers, traders and consumers and by means of studying the internal dynamics of the marketing system. Rapid market appraisal methodology (Holtzman, 1986) may be applied in this step[5]. *The second step* concerns the analysis of the main problems

and opportunities identified earlier. This requires the development of analytical procedures or models which allow for the estimation of the benefits and costs of potential interventions.

5. Agricultural Marketing Issues in an Economic Development Framework

If the scope of marketing analysis shifts from understanding the market itself to the interactions of the marketing system with its economic environment, the issues under analysis also change. As with the marketing management approach for commercial enterprises, the question becomes how the marketing system should react to changes in the environment, or how the environment reacts to changes in the marketing system (e.g., Kotler, 1991). Though the principle of the diagnostic first step, as described in the previous section, is that these changes cannot be fully anticipated, we highlight several issues which require more attention in marketing analysis within an economic development framework.

We distinguish between three principle fields for agricultural marketing analysis in developing countries: interactions between supply and the marketing system, interactions between demand and the marketing system[6], and the dynamic nature of the marketing system itself. To identify relevant issues within these fields, we refer to the expected market changes in the process of economic development as outlined in Table 1.

6. Supply and the Marketing System

A more commercial orientation and increased specialization are salient points in the process of agricultural development: farmers tend to become more responsive to price changes. Estimating price response behavior is the first subject of research. Price and yield risk to farmers normally increase in the specialization process. Commercial systems rely more heavily on purchased inputs, thereby increasing their break-even prices. The reduction in price variability in the marketing system is an outstanding research issue. The overall productivity of the farming system increases, but cash flows may become more uneven. Strategies to overcome the seasonality of producer income using storage, and also by developing credit and savings facilities are relevant. Since farmers only stop relying on farm produce for home consumption if the market makes an adequate, affordable and secure food package available, attention should be given to rural food markets. Input use tends to contribute to increased agricultural productivity, so there is a need for studies on farmer access to inputs[7].

Efficient supply-demand coordination depends on timely market information regarding product availability, prices and quality requirements. Market opportunities which may arise in the process of development should be identified, such as, for example substituting imports with domestic production, or growing export markets. The costs of market access to farmers for transport and credit, time spent on

marketing, and physical losses must be analyzed. The possibilities with which farmers can add value to their supply by grading, sorting or processing should be reviewed. The development of farmer marketing organisations and their strategies need analysis and support, especially now that many countries are reducing the role of their governments (e.g., Janssen, Peters and Van Alphen, 1993).

7. Demand and the Marketing System

In the process of agricultural development, the importance of some traditional food crops (e.g., root crops, legumes) may fall to the benefit of other commodities (e.g., cereals, meat). Diets may become more diversified. Income growth may lead to a dual demand structure, with a small, wealthy group and a large, less prosperous group of consumers. The response of different socio-economic groups to changes in prices and availability is an important subject for researchers and policy makers (e.g., Pinstrup-Andersen, 1985). Industrial demand for agricultural products, e.g., animal feed and food processing needs to be understood. Product differentiation requirements will increase. Product availability and quality requirements should be assessed by income class and by degree of urbanization and food acquisition costs as measured by product price, (opportunity costs of) time spent in purchasing (Becker, 1965), transport costs and product waste must be monitored.

The way in which agricultural products become available to the consumer must be studied by looking at product characteristics, such as, packaging size, the extent of processing, labeling and quality grades, as well as retail outlet characteristics, such as product diversity, payment facilities and opening hours.

8. Dynamic Nature of the Marketing System

In the process of agricultural development, markets and marketing systems tend to become more voluminous and more sophisticated. Volume concerns the process of specialization and of increased product demand at higher income levels, while sophistication concerns the direction and distance of spatial exchange, the control of price fluctuations over time, the process of adding value, and most importantly, the mechanisms for coordinating supply and demand. Transaction costs tend to decrease considerably, but the total marketing margin tends to increase because of value added needed for processing and marketing services.

The ability to redirect agricultural production in response to changing quality requests is relevant. In the initial stages, interlinked or interlocked markets (Ellis, 1988), e.g., the contractual tying of the terms of exchange in an output market to those in factor or input markets, may influence price formation. Market information systems for trends in demand and supply should be put into place. The reactions of the marketing system to short-term changes in demand or supply, as caused by external shocks must be researched. The employment provided by the marketing system is an important contribution to economic development and should be included in market analysis. The ability to absorb improved technologies, e.g.,

product quality control, transportation and storage contributes strongly to growth in agriculture.

9. Modeling Marketing Systems in a Development Setting

To explore the *marketing system*, analysis of transaction costs and marketing margins is critical. In addition analysis of networks of market agents, farmers and consumers, as well as analysis of trader decision making, contributes to the understanding of the functioning of the market. And analysis of the adoption of new technologies in the marketing system provides insight into the absorption capacity of the system.

To estimate the impact of market interventions on the marketing system and its environment, a model is required. It is not possible to provide conclusive guidelines for marketing system simulation models, but some rules can be laid out:

1. The model should measure changes in the variables that have been defined as economic objectives: the model should be objective specific.
2. Model structure should allow for the explicit measurement of market system changes, as forthcoming from the proposed policies: the model should be instrument specific.
3. To avoid unnecessary sophistication, model structure should be restricted to the principal mechanisms which may be affected by market interventions, e.g., Harriss (1993).
4. The model should meet normal validation standards. Various sets of standards are available, but we suggest the set proposed by Bagozzi (1980): theoretical meaningfulness; observational meaningfulness; internal consistency; convergent validity; discriminant validity; and nomological validity.
5. At the minimum, the model should have components representing demand, supply and marketing activities, and a component measuring the costs and benefits of a proposed policy.

A number of such models have been developed in applied economics and marketing research (e.g., Elbers, 1992; Janssen, 1986; Piggott, 1993; and Shalit, 1984). Data requirements tend to be considerable, and may require additional simplifying assumptions (Elbers, 1992) or the use of simplified behavioral equations (Piggott, 1993). One study that pays special attention to the links between marketing and macro-economic variables is elaborated on in Box 1. Box 2 provides a summary of two other studies that link marketing and agricultural sector analysis.

10. Policy Implications

From a public point of view, marketing research and analysis should suggest policies that facilitate or stimulate economic development. We provide some suggestions for policies that may emerge from marketing research.

First of all the generation of new agricultural technologies, e.g., improved crop varieties, animal breeds, cultivation, or land use systems, emerge from marketing

research (e.g., Lynam and Janssen, 1992). Investments in new technologies which correspond with consumer needs and preferences are expected to produce high rates of return and to contribute to economic growth. Marketing research can indicate which commodities or production systems face growing demand, and thus are good candidates for generating improved technologies. For those regions where the traditional commodity portfolio faces weak demand, marketing research may help to identify commodities with improved market prospects. Also, marketing research helps to define the quality requirements of the final consumer.
The generation of improved marketing technologies for storage, transportation, packaging, grading and sorting mechanisms is a second policy area that must be fed by marketing research. The parameters for such technologies should explicitly include producer and consumer interests.

A third field is agro-industrial development, often the first step in a country's industrialization process. By providing employment to rural populations, agro-industrial development contributes to balanced and equitable development. By creating additional demand for traditional or new commodities, agro-industrial development provides incentives for agricultural production growth. Marketing research will show which types of agro-industrial products face increasing demand. The public sector can then stimulate agro-industrial development either through pilot projects or through financial incentives.

Fourth, marketing research can offer inputs to institutional design and strategy, either for public marketing institutions or for farmer interest groups or cooperatives. The marketing research of public marketing institutions may indicate the subjects most in need of regulation (e.g., quality standards, price information, weights, and trading hours) and the effectiveness of the regulations. Marketing research may also show how farmer groups can improve the efficiency and effectiveness of their marketing strategies.

Fifth, marketing research can provide insight into the usefulness of infrastructure development by evaluating the impact of improved infrastructure on transaction costs and market access and the impact of improved market access on the growth in supply.

Sixth, equity-oriented policies can be based on marketing research. Interventions to improve the market access of small farmers (e.g., by intervention offices in poor agricultural areas) or to reduce the cost of food acquisition for poor consumers (e.g., by mobile markets) may affect equity at relative low costs.

Though the list of policy interventions treated in this paragraph is not complete, an outstanding feature of most of the proposed policies is that they not only affect marketing performance but tend to directly benefit producers and consumers. As the examples in the boxes show, the effects of changes in a(n) (agricultural) system

under study or its environment can be simulated, and recommendations to adapt public agricultural policy can be derived.

11. Synthesis and Conclusions

Markets in developing countries operate in a dynamic context. Production and consumption systems are rapidly changing due to changes in income, prices, urbanization, infrastructure, education and other factors. Marketing systems operate as the interface between these changing production and consumption systems. The effectiveness of marketing systems depends on their ability to adapt, react, anticipate and initiate structural economic change. The consequence is that the analysis of markets as stable structures has only limited value.
In our view, the principal evaluation of the performance of marketing systems concerns their contribution to the process of economic development. For example, it is important to know how a particular marketing system stimulates production or stabilizes prices, or how intervention in the system facilitates the attainment of these goals? The relevant indicators for economic development are largely measured outside the marketing system. Thus, the scope of analysis shifts from the marketing system to its interactions with the environment. Identification of deviations from perfect competition, workable competition or contestable markets gives partial insights, but policy makers must also understand which modifications offer the highest returns towards achieving economic objectives? This requires linking marketing research and analysis with government policy instruments, such as, technology generation, industrial settlement policies, infrastructure development or regulation.

To identify possible intervention measures, diagnostic methods may be applied, and in this respect SCP analysis renders a useful service. Such diagnostic research should be linked to the evaluation of any intervention, by means of situation- and problem-specific models which, in turn, link the marketing system with consumption, production and institutional sectors.

Two conditions must be met to make this approach successful. Firstly, *ex-ante* assessments should be linked with *ex-post* evaluations. Validating model estimations with empirical results may lead to revisions in the model or the analytical structure. Secondly, marketing analysis should rely on several scientific disciplines. As exchange relations are often institutionalized, anthropologists or sociologists may formulate the conditions under which these relations continue to exist or break down. If storage policies are proposed, physiologists and bio-chemists may have to develop the model parameters required for an evaluation.

Finally, we emphasize that improvements in marketing systems depend on the stage of development, location specific conditions and developments in the socio-economic and natural environment. Each type of research contains an element of judgment and analysis. The element of analysis has been widely discussed in this

article. The element of judgment will help to understand what type of market improvements are worthwhile and what is subject of evaluation at different stages in agricultural and economic development.

Notes

[1] The authors acknowledge the contributions of Peter Albersen, Barbara Harriss, Nico Heerink, Clemens Lutz, Caspar Schweigman and unknown referees by giving comments on earlier versions of this article.

[2] ISNAR, The Hague, The Netherlands

[3] Deptartment of Marketing and Market Research, Wageningen Agricultural University, The Netherlands.

[4] Stern & El-Ansary (1992) distinguish three performance dimensions with respect to marketing channels: effectiveness, equity and efficiency:

a. Dimensions of effectiveness:
   - Delivery (short term): How well does the marketing system meet the demand of end-users for service outputs (= channel goals)?
   - Stimulation (long term): How well does the marketing system stimulate latent demand?

b. Equity:
   - The extent to which the marketing system serves problem-ridden markets and market segments.

c. Dimensions of efficiency:
   - Productivity: physical dimension (efficiency of resource use).
   - Profitability: financial dimension (profitability).

[5] In rapid market appraisal methods, interdisciplinary teams study marketing systems by means of instant interviews, and by following the flow of supply. Results of different teams are exchanged to arrive at a consensus on the key problems. Rapid market appraisal methods gather quantitative data (e.g., volumes, price structure), but rely strongly on qualitative assessments shared among team members.

[6] It should be pointed out here that there is an overlap with the traditional economic analysis of demand and supply. How supply and demand react to income, price and other incentives is relevant for economics as well as marketing research

[7] Input marketing not only concerns availability, but also information and advice on rational and sustainable use. This is a critical issue for pesticides which contribute to productivity if properly used, but may otherwise create economic, ecological and health problems.

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4 THE IMPACT OF CHANGING PIG WELFARE PREFERENCES ON THE ECONOMICS OF PORK PRODUCTION-MARKETING CHAINS

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1. Introduction

Public concern about issues, such as, animal welfare and environmental pollution appears to be increasing in northwestern Europe and in the US (Guither and Curtis, 1983; Ekesbo, 1992; Barkema, 1993). This creates opportunities for selecting market segments to which more value can be offered through product differentiation. Demands of this type refer to a large extent, to the upstream farm stages of the so-called production-marketing chain, requiring that those consumer preferences be incorporated in all stages involved. In establishing product differentiation policies, animal welfare preferences and the additional cost of or profitability from production have to be balanced. To date, these aspects of animal welfare - perceptions and economics - have been analyzed neither extensively nor in an integrated manner. This paper elaborates on animal welfare in the pork chain, including the evaluation of its perception and economics.

To anticipate the issues which are important for pig welfare and to evaluate the importance of each, one can consult scientific literature and pig welfare experts. However, product development strategies can only be successful if producers adopt a consumer-oriented approach as the consumer ultimately decides what food products are bought (Steenkamp, 1987). Moreover, consumers may evaluate product attributes differently from experts (Kramer, 1990). While the mood of the general public is difficult to gauge, one indication is a proliferation of pressure groups dedicated to improving animal welfare. They may serve as an indicator of public opinion. In this paper, conjoint analysis was used to study the evaluations of pig welfare experts and consumer-related respondents with respect to pig welfare (Green and Srinivasan, 1978).

To evaluate the economic impact of pig welfare, an economic pork chain simulation model was used (Den Ouden et al., 1996a). The model includes a farrowing stage for producing feeder pigs, a fattening stage for producing fattened pigs, and a slaughtering stage. Also, transportation between the stages was considered. As the various stages of the pork chain are linked vertically, their behaviour may influence both their own technical and economic performances, and those of the successive stages. In using the pork chain model instead of models simulating the separate stages of the chain, these so-called interstage relations could also be taken into account. Both the animal welfare evaluations and the costs of the corresponding attributes (Den Ouden et al., 1996b) served as input values in an optimization model (dynamic linear programming). The optimization model is used to evaluate the development of pork production-marketing chain concepts, in which additional costs for realizing increasing levels of additional pig welfare in the pork chain are minimized (Den Ouden et al., 1996c).

2. Material and methods

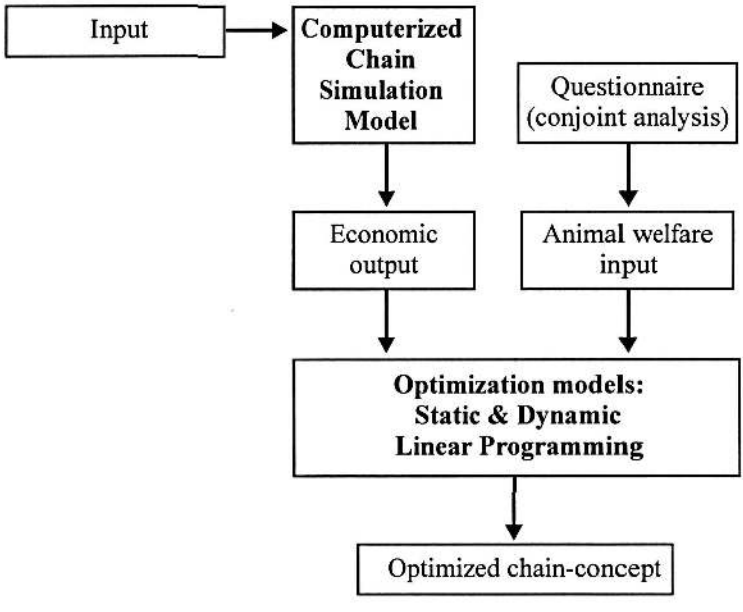

Figure 1: Schematic representation of the methods used in the pork chain models

An overview of the materials and methods used is presented in Figure 1. Issues related to pig welfare were evaluated using a questionnaire based on conjoint analysis of multi-attribute parameters (Green and Srinivasan, 1978). The cost coefficients of the pig welfare attributes were provided by the pork chain simulation model as economic output. They were based on average Dutch data for 1992 to 1993. The cost coefficients served as economic input for the optimization model. A dynamic linear programming model was developed in order to explore the potential

effects of incorporating concerns about pig welfare into the structure and economics of the pork production-marketing chain (further denoted as 'pork chain').

Pig welfare attributes concerned characteristics of pig production and distribution ranging from farrowing, fattening and transportation to pig slaughtering. The attributes and their values were taken from literature, including scientific literature, the popular press and materials from pressure groups for animal rights, and from characteristics of differentiated pork products in the market and discussions with pig welfare experts. Because some of the value levels were not clearly specified in these sources, they were left to be quantified by the respondents themselves. The attributes were divided into two major groups, without the intention of basing these categories on ethological grounds. One group was the attributes related to social contacts with conspecifics or human beings, and the other was the attributes related to the surroundings of the pigs. Attributes in the 'social contacts' group included the mixing of socially unfamiliar animals, the weaning age of piglets and the way in which pigs were handled during transportation and in the slaughterhouse. Mixing unfamiliar pigs is common practice at various stages of the pork chain to reduce the range in sales weight or because the batch sizes vary. Regrouping a socially stable group of animals may increase fighting to re-establish new social rankings (Tan et al., 1991; Karlsson and Lundström, 1992). Rough handling, e.g., by using electric prods to move the pigs, may save labour time but cannot be regarded as beneficial to the welfare of the animal. Attributes related to the surroundings included the type of housing, the stock density in pens, lorries and lairage rooms, the availability of straw, roughage and outdoor space, illumination and ventilation devices, the slope of the (un)loading bridge and the use of water sprays in lairage.

In general, providing more (concrete) floor space, straw as a distraction, a day-night rhythm through illumination and outdoor space were considered beneficial to the pig's welfare (Sybesma, 1981; Fraser and Broom, 1990). Non-lactating sows could be housed individually, either tethered, in cubicles, or in groups. Group housing provided more freedom of movement and social contacts (Fraser and Broom, 1990; Ekesbo, 1992).

In the pig welfare questionnaire, one case was developed for each of the four stages of the pork production-marketing chain. The fattening, transportation and slaughtering cases each included 11 pig welfare profiles, while the farrowing case involved 19 profiles. Per case, each profile had to be judged on an interval scale ranging from 0 to 100. Eight and sixteen profiles per case, respectively, were used to estimate the part-worths of the attribute levels, while the remaining 3 so-called 'hold-out' profiles served to test the predictive validity of the estimated models (Steenkamp, 1985). Ordinary least-squares (OLS) regression analysis was used to break down the respondent's overall judgements on the set of pig welfare alternatives into the contribution of each attribute level. Predictive validity was assessed in terms of Pearson's product moment correlation coefficient (interval scaled data) and Kendall's τ rank correlation coefficient (hierarchically ranked data)

(Siegel, 1956). Both coefficients also served as indicators of the internal validity of the models. To translate stage results into chain results, each respondent was asked to quantify the relative importance of each stage with respect to overall pig welfare throughout the chain. The questionnaires were sent to eleven Dutch respondents, six of whom were pig welfare experts, and the other five represented animal welfare pressure groups and retailers (denoted as the consumer-related group).

The economic effects of the pig welfare-related attributes were calculated using an economic pork chain simulation model (Den Ouden et al., 1996a). The model was developed to simulate technical and economic performances in both individual stages and pork chains as a whole, taking into account interstage relations between the various stages. Costs calculated included labour, interest, depreciation, and raw material costs and other costs, such as the costs of feed, drugs, water and electricity. More details on the simulation model can be found in Den Ouden et al. (1996a).

The pig welfare attributes served as decision variables in the linear programming model. They represented either interval-scaled or binary-scaled variables. The objective of the linear programming model was to minimize the (net present value of the) additional costs incurred per pig in the pork chain concept under the constraint of satisfying the minimal total level of extra pig welfare desired in the chain. Additional constraints were formulated to account for exclusive and 'obliged' relations between the attributes or the cost coefficients. An example of an exclusive relation included the various possibilities for housing non-lactating sows which had to be tethered (default), kept in cubicles or in groups. Examples of 'obliged' relations were the requirement of concrete floor space when straw was supplied and the exclusion of tethered housing of sows when sows were given access to outdoor space. The optimal solution of the dynamic linear programming model represented the most cost-efficient chain concept to produce pork that met a minimal level of additional pig welfare over 't' periods of time. Both the simulation model and the linear programming model were run on a personal computer.

3. Results

3.1. Pig welfare questionnaire

Questionnaires were completed by seven of the eleven respondents. The individuals who failed to respond were one expert and three members of the consumer-related group. The fit of the additive model to the individual data was rather good; Pearson's r was 0.973, on average, with a standard deviation of 0.020 for the farrowing case. Based on hierarchical ranking of the interval scaled scores of the profiles, Kendall's τ equalled, on average, 0.901 ($s(\tau) = 0.072$). The additive model was significant at $p = 0.05$ for six respondents and at $p = 0.1$ for one respondent. Both Pearson's r and Kendall's τ of the additive models for the fattening and the slaughtering cases and of the multiplicative design for the transportation case equalled 1 for all respondents, indicating a very good fit of the estimated models to the input data. In total, the percentage of cases with a significant predictive validity

($p \leq 0.1$) equalled 79% and 68%, as measured by Pearson's r and Kendall's τ respectively. MANOVA of both the regression coefficients per case and of the pig welfare coefficients calculated for the chain as a whole did not yield a significant difference ($p > 0.1$) between the two groups of respondents. This implies that the expected dissension between the experts and the consumer-related group could not be proved by the data in this study.

Table 1: The three pig welfare related attributes per case with the highest average

Farrowing	Importance weight	Fattening	Importance weight
1. Housing non-lactating sows	31.6	1. Supply of straw	24.2
2. Mixing of unfamiliar pigs	17.1	2. Total:Concrete space	21.0
3. Weaning age	12.2	3. Illumination	19.1
Transportation	**Importance weight**	**Slaughtering**	**Importance weight**
1. Handling	30.2	1. Handling	26.9
2. Mixing of unfamiliar pigs	19.9	2. Mixing unfamiliar pigs	21.2
3. Stock density	17.4	3. Water spraying lairage	13.7

At the individual level, attribute importance weights were calculated to indicate the relative importance of each attribute per case (Cattin and Wittink, 1982). In Table 1 the three attributes with the highest average importance weights per case are presented. The respondents showed a fairly high concordance with respect to the attributes they regarded as most important. In the case of farrowing, the attribute 'individual or group housing of sows' was judged most important with respect to the improvement of pig welfare. In general, attributes related to social contacts, including the types of handling and the mixing of unfamiliar pigs, were considered particularly important during transportation and prior to slaughtering. In the farrowing and especially in the fattening stages, the attributes related to surroundings were considered most important.

Table 2 presents the relative importance of each stage with respect to the overall pig welfare throughout the chain, as quantified per respondent. In general, the farm stages fattening (32.6) and farrowing (29.6) were thought to be most important to pig welfare. However, the respondents' individual answers varied considerably. While respondent 7 considered the fattening stage most important to pig welfare (55), respondent 2 assigned the largest weight to the slaughtering stage (40) (Table 2).

The pig welfare coefficients of one expert and one consumer-related respondent were selected for further economic analysis, as presented in the next sections (Table 3). The pig welfare attributes presented in Table 3 are in the order of decreasing pig welfare coefficients as noted by the consumer-related respondent. It is emphasized that the pig welfare coefficients represented estimated pig welfare improvements in addition to the pig welfare level for the default situation. The perception of the pig welfare level for the default situation of each case varied between respondents ranging from -2 to 20 points on a scale from 0 to 100.

Table 2: Individual and average relative importance weights with respect to pig welfare per stage in the chain.

	Expert respondents				Consumer-related respondents			
Stage	1	2	3	4	5	6	7	Average
Farrowing	40	15	17	30	45	35	25	29.6
Fattening	30	15	23	35	40	30	55	32.6
Transportation	20	30	33	20	10	20	10	20.4
Slaughtering	10	40	27	15	5	15	10	17.4
Total	100	100	100	100	100	100	100	100

In agreement with the general perception (Table 2), both the consumer-related respondent and the expert regarded the fattening stage as most important with respect to the overall welfare of the pigs on a scale from 0 to 100, although the total scores varied considerably (55.3 versus 35 respectively (Table 3)). Both respondents especially favoured the surroundings-related attributes in this stage. There were notable individual differences for access to the outdoors. The consumer-related respondent valued this attribute more highly than the expert, who assigned a lower pig welfare coefficient to a greater amount of outdoor space per animal. The same result was shown for outdoor space in the farrowing case. Additionally, the consumer-related respondent considered an increase from two to four hours resting period non-beneficial to the welfare of the pigs, as can be seen from the negative coefficient in Table 3. Similar to the general perception, both the consumer-related respondent and the expert considered the attributes related to social contacts most important with respect to pig welfare during the transportation and slaughtering stages.

3.2. The economics of pig welfare

The economic effects of the pig welfare attributes are presented per animal (Table 3) and represent the additional costs resulting from changing the level of one pig welfare attribute from its lowest (default), or what is expected to be its least preferred level, to the highest, or what is expected to be its most preferred level

(Table 3). In calculating the economic effects, farm sizes were kept constant. Beforehand, there were no estimations of the premium price consumers would be willing to pay for pork produced in each situation. For some attributes, changing the levels also implied a change in the quality of the carcasses, and the effect on the net returns could be quantified. However, most attributes were valued only on the basis of the additional costs incurred. Therefore, the economic effects are further denoted as 'cost coefficients'. In the default situation, total production costs equalled approximately Dfl. 120 per feeder pig sold, Dfl. 188.7 per fattened pig sold, Dfl. 3.6 per transported hog and Dfl. 55 per slaughtered, processed and sold carcass. Therefore, total chain production costs added up to Dfl. 367 per pig from farrowing to slaughter.

The attributes that were classified under the 'social contacts' heading had considerable economic effects, especially in the farrowing, transportation and slaughtering stages. The highest additional costs per feeder pig sold were incurred when the weaning age was changed from four to six weeks at the farrowing farm. As a result, production efficiency dropped considerably from 2.29 to 2.10 litters per sow per year. Because of a need for more - relatively expensive - farrowing pens, housing costs increased. On the other hand, the artificial insemination costs per sow per year decreased. Moreover, because of the longer lactation period, less piglet feed and more sow feed was consumed per sow per year. In total, production costs per feeder pig sold increased by Dfl. 8.76 including extra transportation costs of Dfl. 0.02 because smaller batches of feeder pigs were transported weekly to the fattening farm (Table 3). As a result of the smaller number of feeder pigs sold per year, the number of feeder pig suppliers per fattening compartment increased from 1 to 2. Elbers (1991) found that an increasing number of feeder pig suppliers was associated with higher drug use, higher mortality rates, lower daily gain and higher levels of pathological lesions at slaughter. In addition to his findings, extra costs of Dfl. 3.72 per fattened pig sold were incurred (Table 3). Moreover, due to the smaller number of feeder pigs and fattened pigs sold per year, the additional costs of other variables also increased in combination with the increase in the weaning age of piglets. Similar monetary interactions were calculated between other variables. For example, because illumination was measured in lux per m^2 per 12 hour day, increased space per animal also led to higher illumination costs. In Table 3, maximum illumination costs are presented.

The proposition of not loading pigs on more than one farm had the biggest economic impact for the transportation stage. Based on an average batch size of 60 pigs per farm, the occupancy per truck dropped dramatically causing the transportation costs to increase by Dfl. 3.21 per transported pig. This meant that the costs were almost double those of the default situation. By handling pigs more quietly on their way from the lairage rooms to the restrainer in the slaughtering stage, we assumed that the number of pigs slaughtered per hour decreased by 10%. As a result, the slaughtering costs increased by Dfl. 1.30 per animal.

Table 3. Estimated pig welfare based on the data of a consumer-related respondent (respondent 7 in Table 2), denoted by W_c, and an expert (respondent 4 in Table 2), denoted by W_e. The cost coefficients are also shown. The levels of each attribute are denoted by Δ_C and Δ_E.

		Consumer-resp.		Expert		Cost
	Default	Δ_C	W_C	Δ_E	W_E	(Dfl./pig)
Farrowing						
Social contacts						
- Mixing socially unfamiliar pigs at weaning	Y[1]	N[1]	1.29	N	8.34	1.39[5]
- Weaning age (weeks)	4	6	1.00	6	4.53	8.76[5,6]
Surroundings						
- Outdoor space (m^2/sow)	0	5	5.69	15	2.04	1.98/4.70[7]
- Group housing	N[2]	Y[a]	3.92	Y[a]	8.88	2.78
- Solid:total floor nursery (m^2)	0:3.75	4:6.5	3.18	4:6.5	0.54	0.34:2.39
- Housing in cubicles	N[2]	Y[a']	3.15*	Y[a']	2.57*	2.16
- Supply of straw (kg/pig/day)	0	0.2	3.05	1	2.66	3.20/5.89[7]
- Total floor space non-lactating (m^2)	1.1[3]	1.4[3]	2.35	1.4[3]	-2.13	0.25:0.84
- Illumination standards (lux/12 h./day)	N	20	2.54	20	1.69	0.42
- Moving at weaning	Y	N	2.15	N	1.33	2.09
Maximum welfare points			25.2		30.0	
Fattening						
Social contacts						
- Mixing socially unfamiliar pigs start cycle	Y	N	3.21	N	1.67	3.63[5]
Surroundings						
- Outdoor space (m^2/pig)	0	1.1	16.31	2.5	7.22	8.12/13.51[7]
- Solid:total floor (m^2/pig place)	0:0.57	0.4:0.9	12.96	0.4:0.9	1.67	1.95:8.08
- Supply of straw (kg/pig/day)	0	0.1	10.18	1	11.67	5.88/28.25[7]
- Illumination standards (lux/12 hours/day)	N	20	6.55	20	8.33	0.79
- Supply of roughage (kg./pig/dag)	0	(1/10)[4]	5.16	0.5	3.89	9.39/12.59[7]
- Ventilation automated	N	Y	0.98	Y	0.56	1.57
Maximum welfare points			55.3		35.0	

[1] Y denotes Yes, N denotes No

[2] In the default situation, non-lactating sows were tethered.

[3] In the case of individual housing (either tethered or in cubicles) or group housing of non-lactating sows, the floor space was increased from 1.1 to 1.4 m^2/sow or from 2.0 to 3.0 m^2/sow, respectively.

[4] The amount of roughage fed to hogs was one-tenth of the daily amount of concentrates.

[5] The additional costs per pig were partly incurred in a subsequent stage.

[6] Extra costs (Dfl. 3.89) were incurred because feeder pigs were supplied by two suppliers instead of one.

[7] The cost coefficient left of '/' corresponds to the attribute level of the consumer-related consumer, right of the '/' to that of the expert.

[a-a'] Mutually exclusive attributes; sows can be housed in either cubicles or groups.

		Consumer-related			Expert	Cost
	Default	Δ_C	W_C	D_E	W_E	(Dfl./pig)
Transportation						
Social contacts						
- Handling	rough	quiet	6.10	quiet	6.48	0.08
- Mixing socially unfamiliar pigs at loading	Y[1a]	N[1]	0.82	N	5.35	1.18*
- Loading on various farms	Y[a]	N	0.82	N	2.54	3.21
Surroundings						
- Stock density (kg/m^2)	300[a]	235	0.99	235	2.25	0.69*
- Ventilation automated	N	Y	0.33	Y	0.56	0.06
- Interaction loading density x ventilation	-	-	0.99	-	2.82	
Maximum welfare points			10.05		20.0	
Slaughtering						
Social contacts						
- Handling	rough	quiet	5.30	quiet	3.29	1.3
- Mixing socially unfamiliar pigs during lairage	Y[b]	N	1.56	N	3.29	0.016
Surroundings						
- Stock density (kg/m^2)	300[b]	235	1.25	235	2.46	0.004*
- Automated lifting platforms	N	Y	0.93	Y	2.63	0.04
- Water spraying during lairage	N	Y	0.93	Y	1.63	0.036
- Keep overnight	Y	N	0.09	N	0.08	-0.14
- Resting period (hours)	2	4	-1.25	4	1.63	0.016
Maximum welfare points			10.05		15.0	
Interaction mixing unfamiliar pigs:						
- Farrowing x fattening		-	-0.3		-1.7	
- Farrowing x transportation/slaughtering		-	-0.6		-1.7	
- Farrowing x fattening x transport/slaughtering		-	0.3		3.4	
Total maximum welfare points			100		100	

[1] Y denotes Yes, N denotes No

[a,b] Mutually exclusive cost coefficients. The cost coefficient that is excluded is denoted by *.

In general, the attributes related to the surroundings had a major impact on the economics, especially in the fattening stage. During fattening, the highest additional costs were incurred by allowing pigs access to large amounts of outdoor space (Dfl. 8.12 + Dfl. 4.26 (Table 3)). The concrete space outdoors was fully covered by a roof to prevent rainwater from floating into the manure storage underneath the barn. In order for each pen to have an opening to the outside, fattening barns had to be built longitudinally instead of cross-sectionally. As a result, the fattening pig production costs increased by Dfl. 4.26. The daily supply of roughage and the weekly supply of straw to fattening pigs increased the production costs by Dfl. 9.39

and Dfl. 5.88, respectively (Table 3). A considerable part of these extra costs were for labour. The same holds for supply of straw to sows (Dfl. 3.20 (Table 3)).

In the slaughtering stage, preventing pigs from being kept overnight yielded an economic benefit. This resulted from a savings in compensation equal to 1% of the carcass weight that was paid to a farmer whose pigs were kept overnight. Assuming that, in the default situation, approximately 5% of all pigs slaughtered were kept overnight this means a savings of Dfl. 0.14 per average pig. Since there was no quantitative information available on the extra measures needed to realize this attribute level, only the savings in this compensation were taken into account. This implied an underestimation of the real economic impact. More information on the pig welfare variables and corresponding economics can be found in Den Ouden et al. (1996b).

3.3. Dynamic linear programming

Results of the dynamic linear programming approach (Den Ouden et al., 1996c) are shown for a three-step improvement in additional pig welfare for the consumer-related respondent and the expert (Table 4). In total, it was necessary to realize 50 pig welfare points in three successive steps with increasing pig welfare demands of 10, 20 and 30 points. To satisfy the required pig welfare level for the first step (10 points), the coefficients of the consumer-related respondent resulted in an optimal chain concept incurring Dfl. 0.23 higher costs per pig than in the default situation, i.e., Dfl. 367 per pig from the farrowing to the slaughtering stage. Five attributes were incorporated into this concept ranging from 'not keeping pigs at the slaughterhouse overnight', 'reducing the stock density in the slaughterhouse lairage rooms from 300 to 235 kilograms of live weight per m^2 to 'raising the illumination standards to 20 lux per m^2 per 12 hours period'. While increasing the pig welfare constraint, both values of some attributes which were already included were enhanced and new attributes were added. Besides raising the illumination standards in the farrowing and fattening stage, transportation and slaughtering attributes, in particular, were incorporated into the optimal concepts.

When using the coefficients of the expert, the relatively low additional pig welfare levels were satisfied at lower additional costs per pig (Table 4). In the first step, even a net benefit of Dfl 0.05 per pig was found. Money saved from not having to pay compensation for pigs that stayed at the slaughterhouse overnight was the main source of this net benefit. Moreover, it can be seen that when using the coefficients of the expert, fewer attributes were needed to achieve the same level of additional pig welfare. This resulted from higher pig welfare coefficients attached to attributes with relatively lower cost coefficients. Examples involve the attributes 'stock density' in the slaughterhouse and 'handling' during transportation (Table 3). However, the attributes which were incorporated were almost identical to the ones included in the first steps using the coefficients of the consumer-related respondent. At higher levels of additional pig welfare the additional costs increased progress-

ively. At the maximum level of additional pig welfare attainable with the attributes included in this study, total added costs increased to a maximum of 21% for the consumer-related respondent and 31% for the expert based on the total chain production costs in the default situation (Dfl. 367). Whereas the transportation and slaughterhouse attributes were incorporated first to satisfy the additional pig welfare requirements, the relatively expensive farm attributes, including group housing or housing in cubicles for non-lactating sows, increased - outdoor - area and supplies of straw, only entered the chain concept at higher demands for pig welfare.

4. Discussion and conclusions

Using a chain model instead of separate stage simulation models offers the advantage of taking interstage relations into account. Interstage relations were quantified for both economic effects and pig welfare. Based on the data provided by a questionnaire on pig welfare perceptions, results of conjoint analysis showed that, in general, respondents agreed on the attributes which were considered most important to the welfare of pigs. The attributes related to surroundings, including the supplies of straw and the group housing of non-lactating sows, were found to be the most important in the fattening and farrowing stages, respectively. Attributes related to social contacts, on the other hand, were considered most important in the transportation and slaughtering stages of the pork chain. The latter group, e.g., included the way the pigs were handled. Although the pig welfare coefficients of the consumer-related respondent and the expert used in the optimizations were not similar, and can only be perceived as individual perceptions, the sequence in which the various attributes entered into the chain concepts greatly resembled each other. In particular, transportation and slaughtering attributes were implemented first, while the more expensive farrowing and fattening surroundings related attributes were implemented only at increasing demand levels for additional pig welfare.

4.1. The validity of the results

In general, the predictive validity of the estimated models was good, indicating that the respondents were quite capable of a consistent evaluation of the pig welfare attributes. On average, Pearson's r and Kendall's τ equalled 0.92 and 0.78, respectively. Although the attributes and attribute levels incorporated in the models were carefully selected, some attributes will have been excluded although they may affect both the welfare of the pigs and the responses thereof in the marketplace (Cattin and Wittink, 1982). Whereas in this study handling was regarded as most important to pig welfare during transportation and at slaughter, the study of Van Putten and Elshof (1978) showed that the slope of the loading bridge had the greatest effect on pig welfare. The second largest effect in their study was from electric prods, which was included as part of the attribute 'handling' in our study. Moreover, 'handling' as described in this study, also included the (in)appropriate illumination of areas through which pigs were moved, which was also treated separately by Van Putten and Elshof (1978). Based on the many publications in which the individual or group-based housing of sows have been - explicitly -

discussed with respect to pig welfare (Sybesma, 1981; Fraser and Broom, 1990; Ekesbo, 1992), the finding in this study that housing was perceived as the most important sow welfare attribute is acceptable.

The calculated cost coefficients may not all have been equally or fairly comparable to one another. The levels of some pig welfare attributes represented situations that are not common in practice. This, for example, held for the supply of large amounts of straw, roughage or outdoor space. Moreover, since outdoor pig farming is a recent development and not (yet) as widely adopted as the traditional system, research on more (labour and cost) efficient working procedures and operating devices has just started. No quantitative information was available on the additional measures needed to realize the attribute level related to slaughtering pigs without an overnight stay at the slaughterhouse. As a result, only the cost savings from not compensating the farmer could be taken into consideration. However, the extra costs of measures for preventing pigs from staying overnight may prove to be - far - more expensive than the compensation rates paid to the farmer. In economic evaluations of the Dutch outdoor pig production system, Bens (1994) reported comparably high labour requirements for supplying straw and roughage and access to outdoor space for both piglet production and the production of fattened pigs. Moreover, the effects he calculated from increasing the weaning age of piglets from four to six weeks were similar to those in this study. Van 't Klooster (1987) reported additional housing costs ranging from Dfl. 1 to almost Dfl. 6 per fattened pig per year for remodelling fully slatted floor barns (0.54-0.60 m^2/pig) into partially slatted floor barns (0.68-0.75 m^2/pig). These figures are in line with the - new construction - cost effects described in this study.

Changes in farming, transportation and slaughtering systems may influence technical performance. Although production results cannot be considered valid indicators of animal welfare, in reverse, it may be expected that measures aimed at improving the well-being of animals will reduce harm to the animals, such as, injuries, mortality or other production losses. For example, Elbers (1991) found that increased floor space per pig, partially slatted instead of fully slatted floors, and the use of delivery pens, were significantly associated with a lower prevalence of pathological lesions found at slaughter. Both the use of intermittent water sprays in lairage rooms (Weeding et al., 1993) and avoiding mixing pigs (Karlsson and Lundström, 1992) resulted in improved meat quality. The latter also reduced skin lacerations (Karlsson and Lundström, 1992) and was associated with increased growth and food efficiency (Tan et al., 1991). However, observations indicating a reverse relation between pig-welfare-related farming systems and production results have also been described. For example, Mortensen et al. (1994) reported lower production results from outdoor pig production systems, including higher piglet mortality and lower feed efficiencies. In this paper, the effects of pig-welfare-related attributes on technical performance have not been taken into consideration. Future research on this type of effects may be useful, however, as economically optimal solutions may change when production considerations make a costly attribute more

or less attractive. Thus far, the additional costs calculated in this paper can be used as indicators of the level of the premium price buyers must be willing to pay and/or the improvement in technical performance needed to break-even.

4.2. Distribution of costs and pig welfare contributions over stages

It was shown that at increasing levels of pig welfare, the additional costs incurred increased progressively. Although there are additional costs from taking animal welfare into account, some consumer segments may be willing to pay a premium for these products. Steenkamp and Oude Ophuis (1987) reported that consumers of pork produced outdoors would accept a premium of Dfl. 1 to Dfl. 2 per kilogram of meat. The redistribution of a premium back over the production stages may be based on the additional costs incurred.

When analyzing the distribution of costs and pig welfare contributions for the concepts described in Table 4, it was found that the additional costs were unequally distributed over the stages of the pork chain. At an additional pig welfare level of 10 points, the slaughtering stage even yielded an economic benefit, whereas the farrowing and transportation stages incurred additional costs. For example, based on the consumer-related respondents' results, the transportation stage contributed 61% of the additional pig welfare (10 points) at 35% of the total additional costs incurred (Dfl. 0.23/pig (Table 4)). As the desired levels of pig welfare increase, the farm stages for farrowing and fattening incur increasing shares in both the additional costs and improved pig welfare. Moreover, the increase in total additional costs that could be attributed to each stage was different with respect to the default production costs. For example, a 49% share in total additional costs at a level of 50 extra pig welfare points (Table 4) meant an increase of approximately 4% in total fattening costs, while a 9% share of the transportation stage was related to a cost increase of more than 36% relative to the default situation.

In general, the results of this study are an initial contribution to the establishment of pork differentiation policies in order to respond to pig welfare concerns. The approach is general enough to be used to examine other characteristics, such as, animal health and related food safety issues. The results can be used to add to further evaluations of consumer preferences for pork products so as to include buyer characteristics and other relevant product attributes besides animal welfare, such as, price levels and environmental characteristics.

Table 4: Results of the dynamic linear programming approach: least-cost (Dfl./head) pork chain concepts for the desired additional pig welfare level of 50 points in three successive steps of 10, 20 and 30 points, using the coefficients of the consumer-related respondent and the expert

			Overall pig welfare level chain							
			Consumer-related respondent				Expert			
			10	20	30	50	10	20	30	50
eriod (Dfl/head)			0.23	0.97	2.81	10.51	-0.05	0.61	1.19	4.23
nal costs (Dfl./head)			0.23	1.20	4.01	14.52	-0.05	0.56	1.75	5.98
	Default	Stage								
	Y	S	N	N	N	N	N	N	N	N
ig)	300	S	235	235	235	235	235	235	235	235
	2	S	-	-	-	-	3.2	3.25	3.25	3.5
	rough	T	quiet	quiet	quiet	quiet	quiet	quiet	quiet	quiet
pen (m^2)	0	F	0.07	0.07	2.31	2.31	-	-	-	-
urs/day)	N	F	20	20	20	20	-	-	-	-
resting	N	S	-	Y	Y	Y	-	Y	Y	Y
orms	N	S	-	Y	Y	Y	-	-	-	-
	N	T	-	Y	Y	Y	-	-	-	Y
urs/day)	N	H	-	20	20	20	-	20	20	20
ig)	300	T	-	275	235	235	-	-	235	235
	rough	S	-	-	quiet	quiet	-	-	-	-
(m^2)	1.1	F	-	-	1.4	1.4	-	-	-	-
rtation	Y	T	-	-	N	N	-	-	N	N
	Y	S	-	-	N	N	-	-	N	N
^{2}/place)	0	H	-	-	0.03	0.20	-	-	-	-
)	0	F	-	-	-	5	-	-	-	-
sows	teth.	F	-	-	-	cubi.	-	-	-	group
/week)	0	H	-	-	-	0.64	-	-	-	-
	Y	F	-	-	-	-	-	-	-	N

F = Farrowing stage, H = Hog fattening stage, T = Transportation stage, S = Slaughtering stage

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Notes

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PART 2

EVOLUTION IN CHANNELS AND INSTITUTIONS

EVOLUTION OF AGRICULTURAL MARKETING INSTITUTIONS: A CHANNEL APPROACH

5

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1. Introduction

The marketing channels for agricultural and food products are made up of a number of companies, such as, breeders, mixed feed producers, farmers, traders, processors and retailers. The role of these companies in the marketing channel is as a marketing institution, that is an organisation which is engaged in the marketing planning and the marketing functions related to a specific product. Agricultural marketing channels sometimes include special marketing institutions, such as, auctions, marketing cooperatives, marketing boards, commodity boards and futures markets.

The need for market orientation in Western agricultural markets has stimulated the coordination of marketing operations in the channel. Many agricultural marketing channels have become vertical marketing systems, also called marketing chains, which are characterized by coordinated marketing policies. Agricultural marketing institutions must respond appropriately to the need for coordinated marketing policies in the channel. This requires an understanding of marketing institutions as *actors in the agricultural marketing channel.*

Marketing theory has contributed a great deal to our knowledge of marketing institutions. Concepts and theories from industrial economics are also helpful in this respect. However, the growing importance of marketing chains, or vertical marketing systems, in agricultural marketing calls for a better understanding of marketing institutions as actors in the channel. This article contributes to this by reviewing the literature on marketing institutions as an element of the marketing channel and by proposing a framework for the analysis of agricultural marketing institutions as actors in the marketing channel for a product. Needless to say, our contribution borrows heavily from the relevant marketing literature, in particular, the literature on marketing channels (e.g., Bucklin, 1970; Mallen, 1977; Sheth, et al., 1988; Stern and El-Ansary, 1992).

Our paper is organized as follows. First, some aspects of agricultural marketing institutions as actors in marketing channels are presented and environmental trends which influence agricultural marketing channels are described. Some important

contributions from marketing theory and industrial economics to the discipline of marketing channels are reviewed. Next a framework for the analysis of marketing institutions as actors in marketing channels is proposed and its usefulness for the analysis of agricultural marketing institutions is elaborated upon.

2. Marketing institutions in agricultural marketing channels

Basic characteristics of marketing institutions as actors in agricultural marketing channels. In the marketing of agricultural products functions are performed, which are traditionally classified as *exchange functions, physical functions and facilitating functions* (Clark and Clark, 1947; Kohls and Uhl, 1990). The shift towards a consumer orientation has stimulated *marketing management* in agricultural marketing (Meulenberg, 1994, p.3), that is, the planning, implementation and control of the marketing mix with respect to the needs and wants of consumers. Agricultural marketing plans and marketing functions are programmed and executed by producers, traders and/or other marketing institutions:

- *price formation*, buying *and selling* are executed by producers and distributors. Special marketing institutions, such as auctions (price discovery) and futures markets (price-risk management) facilitate the price formation process.
- *product development*, traditionally a task of breeders, farmers and food industry, is increasingly becoming an activity of big retail food chains, too. In some agricultural sectors, special research institutes, financed by government and/or by industry, do product research which is beneficial to all companies in the industry. Industry bodies and government establish and monitor grading and sorting schemes for agricultural products, and in particular, for agricultural commodities.

Promotion of agricultural and food products not only includes product and brand promotion by individual companies, but also generic promotion by promotional boards. Agricultural promotional boards are important in many countries, but promotion by individual companies is gaining importance because of a trend towards bigger companies in the agribusiness and food industries, which prefer to promote their own products and brands instead of spending funds on generic promotion.

- *distributive tasks* in agricultural marketing are fulfilled by producers, wholesalers and retailers, as well as by special marketing institutions, such as, marketing cooperatives. Logistics firms have an important task in physical distribution.

Agricultural marketing institutions differ both with respect to the type of marketing functions performed and with respect to the degree of involvement in the marketing process. For instance, many food companies are full fledged marketers of branded products, while food brokers only mediate between buyers and sellers, and agricultural auctions essentially facilitate the price discovery process.

Various agricultural marketing institutions have extended their activities from basic marketing tasks into new fields. For instance, Dutch horticultural auctions started out as institutions which facilitated price discovery, but quite soon became logistical centres and extended their marketing tasks into other fields, such as, promotion, minimum price schemes, sorting and grading and product quality (Meulenberg, 1989). They probably will end up as marketing cooperatives, with limited sales by auction. Food retailers have evolved from distributors to sophisticated marketers. Interestingly, marketing institutions take up new functions not only because of their special expertise, but sometimes also because of their strong channel power. The example of Dutch cooperative horticultural auctions is a case in point.

The performance of marketing tasks in agricultural marketing channels is increasingly based on good relationships between marketing institutions. These relationships are based on joint planning and trust, and are sometimes formalized in contracts or integration. Strong relationships between agricultural marketing institutions are extremely important in view of the present need for the coordination of marketing plans at the various stages of the marketing channel. This is, in particular, relevant for the marketing of fresh produce, such as, fresh meat, fruit and vegetables and flowers.

2.1. Trends in marketing institutions

The role of marketing institutions in the channel is influenced by a number of trends, both external and internal to the marketing channel. We briefly review the impact of some major trends.

2.1.1. External trends

Achrol and Stern (1988) concluded in an analysis of the way environmental factors affect decision making uncertainty in channels that, "....four dimensions – diversity among consumers, dynamism, concentration, and – should be included in future research on the effects of environments on intrachannel variables." Environmental trends, such as socio-cultural, competitive, ecological, technological and political trends, greatly influence the role and function of marketing institutions in agricultural marketing channels. We briefly summarize the impact of these trends.

Socio-cultural developments. Socio-cultural developments have a strong impact on consumer behavior and consequently on agricultural marketing channels. The following developments seem particularly relevant.

- Demography. The greying of western populations stimulates the importance of food marketing channels which serve institutional households. Small households and women in the workforce reinforce consumer needs for distributive services, such as, product packaging and longer store opening hours. The concentration of the population in urban centres and increasing consumer mobility have a positive impact on the size of food outlets and

their locations. The trend towards multicultural societies in Western countries increases the opportunity and need for broader retail product assortments.

- Consumer behaviour. The increasing importance of health, freshness, convenience and variety in food consumption advances wider and deeper food assortments in supermarkets, and places greater demands upon logistical efficiency. The food consumption habit of grazing has made product availability to consumers a more important issue.

Competition. Competition is increasing in Western agricultural and food markets. Markets are more open as a result of the Maastricht treaty and the GATT agreement. Advances in logistics and information technology enlarge international competition in food marketing. Retail chains internationalize their purchasing of food products. For instance, retail chains purchase wines from Chili, South Africa or Australia, and fresh vegetables from Morocco and flowers from Kenia or Colombia.

Ecology. Societal concerns about sustainability foster "green" logistics, with respect to among others, the mode of transport and the packaging. It also stimulates new marketing outlets for organic food.

Technology. Technological developments in, in particular information technology and transport, create opportunities for improvements in efficiency in agricultural marketing channels.

Politics. The overriding trend in the political environment for agricultural marketing channels is "less government interference and more market access". In contrast to this general trend, government intervention is increasing because of environmental problems resulting from processes in agricultural marketing channels.

The responses of marketing channels to changes in the external environment are often initiated by a specific marketing institution in the marketing channel, for instance, a food retailer. In line with Von Hippel's theory, one might hypothesize that the marketing institution, which expects the greatest profits from an innovation, will trigger that innovation in the marketing channel (Von Hippel, 1988).

2.1.2. Internal factors

Experiences, research findings and creative ideas about marketing institutions also contribute to innovations in the channel. This type of innovation is becoming more frequent because of the concentration among companies in the food industry and in food retailing. Big companies in the agricultural marketing channel are focusing on quality and innovation, are very demanding of their suppliers and are spending more money on research and development.

consumer satisfaction; the *macromarketing* school, which studies the role and impact of marketing activities and marketing institutions on society and *vice versa*: the *systems* school of thought, which analyzes marketing from a systems point of view; and the *social exchange* school, which focuses on the foundations of social exchange.

3.2. Industrial organisation theory and marketing channels

Transaction costs theory (Williamson, 1975, 1985), an important area of in industrial organisation theory, is frequently used in the analysis of marketing channels. Entrepreneurial characteristics, such as, opportunism, and bounded rationality, and transaction characteristics, such as, asset specificity, uncertainty and complexity, frequency and governance costs appear to be useful concepts for the analysis of the governance structures in the channel. For instance, Gassenheimer et al. (1996) concluded, on the basis of an analysis of fast food franchisees in the U.S., that, "communication moderates the impact of opportunism on satisfaction," and "A significant negative relationship remains between opportunism and franchise satisfaction."

While asset specificity is traditionally considered to be an exogenous variable in the transaction costs approach, Riordan and Williamson (1985) introduce asset specificity as a choice variable in the decision process for a governance structure. In explaining the structures of conventional marketing channels, Heide and John (1988) extend the basic transaction costs model with insights from dependence theory.

Conclusion. The marketing channel is an important topic in marketing theory. However, theories on the evolution of agricultural marketing institutions as *actors in the marketing channel* from producer to retailer are less numerous. Actually, this evolution is becoming increasingly important in agriculture in view of dynamic changes in the markets. Therefore, in the next section, a framework is proposed for identifying the strategic position of a marketing institution as an actor in the channel.

4. A framework for the analysis of the strategic position of marketing institutions in the marketing channel

We suggest the following hierarchical classification as a useful instrument for better understanding the role of marketing institutions in agricultural marketing channels:

a) *strategic marketing institutions*, which determine the basic marketing strategy of the product involved and, for that reason, the core characteristics of the marketing mix;
b) *tactical marketing institutions*, which plan and implement tactical marketing policies within the framework of the basic marketing strategy, for example, an agent or dealer operating on behalf of his principal;

the behavioral point of view. Initiated by Stern (1969), contributions from this school concentrate their analysis upon power, conflict and satisfaction in marketing channels. A great diversity of research questions has been addressed, such as: "What is the impact of different types of power sources - coercive versus noncoercive - on conflict in the channel of distribution?" (Hunt and Nevin, 1974); "What factors affect the probability that the less powerful channel member will comply with the wishes of the more powerful channel member?" (Hunt et al., 1987); Can the power of a channel leader "be offset by the countervailing power available to the channel members?" (Etgar, 1976).

Special attention has been devoted to the relationship between companies in the marketing channel. Coordination between marketing institutions in the marketing channel has been analysed extensively. For instance, Celly and Frazier (1996) investigated outcome- and behaviour-based coordination efforts in the relationship between supplier personnel and distributors. They established a strong positive relationship between environmental uncertainty and behaviour-based coordination efforts.

Vertical marketing systems are classified on the basis of the strength of the relationship, such as, administered, contractual and corporate systems (Stern and El-Ansary, 1992). Much attention is paid to franchising. Various authors stress "resource constraints" as the argument for using franchising, while others emphasize the "incentive" argument, that is, the need to motivate franchisees to put sufficient effort into their business (see, e.g., Lafontaine and Kaufmann, 1994). Anderson and Weitz (1989) conclude that interpersonal relationships ensure the continuity of industrial channel dyads. Kumar et al. (1995) demonstrate that, "with increasing interdependence asymmetry, the dealer's trust in and commitment to the supplier decline while interfirm conflict increases." Trust between companies in the marketing channels has become an important research subject (see, Geyskens and Steenkamp, 1995).

Behavioral research on marketing channels has stimulated the development of frameworks for the analysis of marketing channels. Stern, Reve (1980) developed a framework which takes into account economic and behavioral, and internal and external respectively, factors which influence the structure of the marketing channel. Frazier (1983) proposes a framework for interorganisational exchange behavior in marketing channels, which structures the exchange relationship of a firm with a target firm through the successive stages of initiation, implementation and review. Dwyer et al. (1987) outline a framework for the evolution of buyer-seller relationships through five phases from awareness until dissolution.

Other schools of thought in marketing, as distinguished by Sheth, et al. (1988), have contributed little to theories and concepts on marketing channels and marketing institutions: the *buyer behavior* school, which focuses on customers in the market place; the *activist* school, which is concerned with issues of consumer welfare and

transformations from raw material to final product (Alderson, 1954, 1965), are relevant concepts for channel formation since they concern functions often carried out by middlemen.

In the *managerial* school of thought the planning of the marketing mix, in particular the *place or distribution,* has implications for the structure of marketing channels, and for that reason, for the role of marketing institutions. However, no explicit attention is paid to the structure of marketing channels and marketing institutions as such.

The *institutional* school, focusing on "the *organisations* that actually perform the functions required to move the goods from the producer to the consumer" (Sheth et al., 1988, p. 74), contributes a great deal to the theory of channel formation and of marketing institutions. Many scholars have analyzed marketing institutions from the efficiency point of view (Alderson, 1954; Stigler, 1951; Mallen, 1953, 1977; McCammon, 1963; Bucklin, 1965, 1970; Vaile et al., 1952). Attention has been paid to the transfer of marketing functions in the marketing channel from one marketing institution to another out of efficiency reasons. Stigler's (1951) concept of vertical specialisation and Mallen's (1953) "spin off" concept are cases in point. Bucklin (1970) and Mallen (1977) have developed classification systems to describe marketing channels.

In the case of *perfect competition* costs ultimately determine the channel structure. When the market structure differs from perfect competition, which increasingly happens to be the case in agricultural markets, effectiveness and/or equity are important criteria, too. Many studies which emphasize marketing efficiency as a criterion for channel structures have also included the effectiveness of marketing as a criterion. For instance, while Bucklin accentuates costs as a criterion for channel formation, his concepts and analyses, such as *"Postponement and speculation"* (Bucklin, 1965), and the variables *assortment* and *waiting time* (Bucklin, 1966), are demand-related as well.

Etgar and Zusman (1982) propose a model of marketing channel formation that assumes that wholesalers maximize profits by buying, processing and selling information. Models from management science (see Lilien et al. 1, 1992, pp. 415-431; Stern, El-Ansary, 1992, pp. 304-311) analyze channel structures by focusing on the relationship between a profit maximizing manufacturer and a retailer under different assumptions about: a) the degree of integration (the retailer is integrated with the manufacturer or is independent); b) the type of market structure (the manufacturer is a monopolist or not; and sells to an exclusive retailer or not (McGuire and Staelin, 1983)); c) the profit function of the manufacturer (costs of retail services are fixed, marginal costs of production and retailing are stable, the demand function is linear or non linear); d) the profit-sharing arrangement (Jeuland and Shugan, 1983).

The *organisational dynamics* school of thought analyzes marketing channels from

3. Theories about marketing institutions as actors in the marketing channel

Many theories about marketing channels are concerned with marketing institutions. Not only marketing theory but also industrial organisation theory, contributes to insights in the role of marketing institutions in marketing channels.

3.1. Marketing theories about marketing channels which are relevant to marketing institutions

Channel formation and the role of marketing institutions in the channel is a central topic for marketing theory. The following review of highlights in this field is structured using the classification of marketing schools as proposed by Sheth *et al.* (1988).

The *Commodity School* developed product classification systems which seem to be relevant to marketing channel formation. Copeland's (1923) classification of *convenience goods, shopping goods and specialty goods* and its extension by Holbrook and Howard, by adding a fourth class, *preference goods*, (quoted by Sheth et al., 19-88, p. 45) have implications for consumer shopping habits and, as a result for the location of retail outlets. Aspinwall (1962) argued that the type of product influences the channel structure: an indirect marketing channel, i.e., a channel including a middleman, will emerge between a producer and a consumer if the good has a high replacement rate and a low gross margin, rate of adjustment, consumption time, search time, and *vice versa*. Miracle (1965) extended Aspinwall's classification scheme. Rangan et al. (1992) proposed a more comprehensive list of eight selection criteria, which are related to product, information, service and logistics.

The creators of the *functional* school focus on activities needed to execute marketing transactions (Sheth et al., 1988, p. 53), but do not pay special attention to the institutions which perform these functions. Actually, in this school of thought, the marketing channel structure is a corollary of the performance of marketing functions.

The *regional* school of thought, concerned with "marketing as an economic activity designed to bridge the geographic, or spatial, gaps between buyers and sellers (Sheth et al., 1988,p 60), has produced models on the attractiveness of shopping centres and stores, and on interregional marketing. However, these models make no explicit reference to the analysis of marketing institutions and the channel structure.

In the *functionalist* school, which conceives marketing of "as a system of interrelated structural and interdependent dynamic relationships" (Sheth et al., 1988, p. 86) concepts are proposed which are relevant to a better understanding of the channel structure and of the marketing institutions. In particular, according to the *"sorting principle"*, sorts by which a heterogeneous supply is matched with heterogeneous demand, and *"transvection"*, the sequence of exchanges and

c) *facilitating marketing institutions*, which facilitate marketing processes, without being involved in marketing decision making with respect to the product, for example an auction or a futures market;
d) *facilitating institutions*, which offer services to marketing institutions in the channel, without getting involved in the marketing process as such, for example freight companies.

Whether a marketing institution belongs to one of these categories depends on its involvement in the:

- *marketing object*, that is the channel flows,
- *marketing goals* in relation to channel flows,
- *marketing functions* in relation to channel flows,
- *relationships* with other marketing institutions.

This argument will be elaborated on below.

4.1. The classification of marketing institutions on the basis of their involvement in channel flows

Marketing institutions are concerned with different flows in the channel: *property flows, product (service) flows, and information flows* (Mallen, 1977; see also Bucklin, 1970). The involvement of marketing institutions in these flows differs. We propose the following criteria for classifying marketing institutions.

a) Property flow.
- taking title to a good is a necessary condition for being a *strategic marketing institution*; product ownership is essential for making strategic marketing decisions.
- directing property flows is a necessary condition for being a *tactical marketing institution*, for example an agent marketing a product on behalf of his principal,
- having no influence on property flows is a characteristic of *facilitating marketing institutions*, such as auctions and futures markets, or *facilitating institutions*, such as freight companies.

b) Product flow.
- determining the "core benefits" of a product is a characteristic of *strategic marketing institutions;*
- determining at least some *augmented product* benefits is characteristic to *a tactical marketing institution*;
- influencing product flow direction, but not product benefits, is characteristic for *facilitating marketing institutions*, such as, auctions houses;
- involvement in physical product flows without directing product flows from the marketing point of view is characteristic to *facilitating institutions*, such as, logistics companies.

c) Information flow.
- All marketing institutions in agricultural marketing channels are involved in information flows. The type of information transfer is related to the role of a marketing institution with respect to property and product flow.

4.2. Classification of marketing institutions on the basis of their involvement in marketing goals

The involvement in marketing goals differs between institutions:
- developing long-term marketing goals is a characteristic of *strategic marketing institutions.*
- developing short-term marketing goals *only*, for example the marketing target of a special promotional campaign is a characteristic of *tactical marketing institutions,* such as, agents operating within the bounds of the long-term strategy of their principal.
- developing goals with respect to the performance of a specific marketing function or operation, for example price discovery, is a characteristic of *facilitating marketing institutions.*
- no involvement in marketing goals with respect to a product but being concerned with the efficiency of marketing operations is a characteristic of *facilitating institutions.*

4.3. Classification of marketing institutions on the basis of involvement in marketing functions

Marketing functions fulfilled by a marketing institution are related to *marketing objects* and *marketing goals*. For this reason, there is an overlap between the classification rules related to marketing functions and those related to channel flows and goals:
- marketing institutions which carry out the function of developing the core product are *strategic marketing institutions.*
- marketing institutions which fulfil marketing functions within the constraints of the basic marketing strategy of the strategic marketing institution are *tactical marketing institutions,* for example dealers, agents, franchisees.
- marketing institutions which improve marketing effectiveness and efficiency without being a marketing partner in the exchange process are *facilitating marketing institutions*, for example auctions which improve price discovery or promotional boards which promote the generic product at the industry level.
- institutions which improve the efficiency of marketing institutions in the channel without being involved in marketing processes are *facilitating institutions*, for example market research companies or freight companies.

4.4. Classification of marketing institutions on the basis of their relationships in the marketing channel

An important characteristic of a marketing institution is the relationship with other marketing institutions in the channel. The following aspects of the relationship between marketing institutions in a marketing channel seem important for characterising a marketing institution:

- the strength of the relationship may vary from *no relationship* at all (spot contract) to *full integration* (vertical integration).
- the strength of the relationship is positively related to the *sophistication of the marketing plan* in the channel and also the *uncertainty and complexity* and *asset specificity* of the marketing operations.

5. Response of agricultural marketing institutions to a changing environment

Many agricultural marketing institutions operate in rapidly changing markets. Therefore it is important that a marketing institution is aware of its actual and potential role in the channel. The proposed framework may be helpful in this respect and may be applied "*ad hoc*" to any agricultural marketing channel. Its special feature is that the strategic position of the marketing institutions is analyzed within the context of the agricultural marketing channel from producer to retailer. Also on the basis of the developed framework, some general hypotheses about the response pattern of marketing institutions are made.

Hypothesis 1. Changing marketing policies for an agricultural product may lead to the exclusion of a marketing institution from the channel. The probability that a marketing institution will be excluded increases in the sequence: *a) strategic marketing institution, b) tactical marketing institution, c) facilitating marketing institution, d) facilitating institution.*

This hypothesis is based on the presumption that:
a) the channel power of a marketing institution in the marketing channel of a product is decreasing in the sequence "strategic....facilitating institution."; and,
b) an institution in the marketing channel can be replaced more easily, when it delivers a less fundamental contribution to the marketing programme of the respective product.

Hypothesis 2. Strong relationships between marketing institutions have a positive impact on the adaptive potential of marketing institutions provided that these adaptations fit the basic marketing strategy of the core product.

This hypothesis is based on the following considerations. A strong relationship between marketing institutions in a channel decreases uncertainty and creates better opportunities to develop, communicate and implement specific responses to market

changes in the channel. This is particularly important in the present agricultural and food markets, where the augmented product and customer services must be modified frequently because of changes in customer needs and in competition.

Hypothesis 3. Strong relationships between marketing institutions in a marketing channel may have a negative impact on the flexibility of marketing institutions when the basic marketing strategy of the core product is under threat.

This hypothesis is based on the argument that fundamental innovations have less opportunity to penetrate the channel when all marketing institutions in an agricultural marketing channel closely cooperate within the framework of a well-established marketing strategy for the core product.

Hypothesis 4. The response of a marketing institution to market threats is influenced by the basic instinct of a marketing institution for survival.

This point is particularly relevant for *strategic marketing institutions* which have a strong power in the marketing channel. It stimulates politicking in response to market threats and creates short-term solutions which are not viable in the long run.

6. Final remark

The proposed classification scheme treats marketing institutions on the basis of objects, goals, functions and relationships. As such, a marketing institution is not necessarily one separate company, but may also be a joint effort between a number of different companies. Such an approach to a marketing institution fits with the one of Duddy and Revzan (1953, pp. 16, 17), the leading scholars of the institutional school where: "The institutional approach views the economic order as an organic whole made up of a great variety of economic structures, whose functioning is coordinated not only by prices and profit margins, but by management using authoritarian and persuasive techniques, by government regulation, and by social convention and custom."

Notes

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6 THE IMPACT OF CHANGES IN THE POWER AND INFORMATION BALANCE UPON THE QUALITY OF SUPPLIER-RESELLER RELATIONSHIPS IN FOOD MARKETING CHANNELS

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1. Introduction

Corstjens and Corstjens (1995) argue that fast moving consumer goods (FMCG) marketing has become a struggle between manufacturers and retailers for control of consumer mindspace and store shelfspace and that, in the final analysis, mindspace will be the decisive resource. Where once the manufacturer dominated on both, the retailer is now taking back shelfspace and making inroads in mindspace. Co-operation between retailers and manufacturers is possible in some areas, but fundamentally their interests conflict as both seek to control the same scarce resources: mindspace and shelfspace. Partnerships may be sought only from a position of strength and affecting the balance of power may become a major aim of marketing strategy for both retailers and manufacturers. When the latter process occurs, the use of the reseller's new power over manufacturers (Grant, 1987) may not only have a negative impact on the manufacturer's welfare, but also on the quality of the relationship between dyadic partners.

This danger can be illustrated by an example from the Dutch food marketing channel. Manufacturers of branded food products are becoming increasingly concerned about the perceived growth in power of resellers. Recently, the powerful Dutch retail chain Albert Heijn announced that it had discovered that money was lost on selling products like beverages, beer and dairy products. The logistical operations to get these products into its stores costs so much money that direct profits are negative for these products. Albert Heijn now wants to discuss the possibilities of solving this issue with manufacturers. Most likely, feasible solutions

will require the passage of more money from the hands of the suppliers to the retailer, such as relieving the retailer of the cost of capital for stocking the goods. Albert Heijn, in the meantime, has made it clear that suppliers unable to solve the problem will find their products removed from the shelves.

In this research, we focus upon the impact of retail power upon the quality of the relationship in the dyad. We do this from both the more traditional perspective of power itself and from the growing role of information and its generation by both sides of the dyad. Traditionally, manufacturers were the party who bought market research data from syndicated services like A.C. Nielsen and used these data to plot a marketing strategy for the entire channel. This ability of the manufacturer made resellers dependent upon manufacturers for marketing programs and promotional insight.

Now, store information systems provide retail management with an important advantage in the battle for mindspace (Corstjens and Corstjens, 1995). More and more reselling organisations employ scanner data to predict sales and eliminate the guesswork of the past and reliance upon the manufacturer. Some retailers may also limit access to customer shopping data and brand choice behavior within their stores. As Glazer (1991) states "...a major determinant of marketing power has always been the level of information possessed by marketing agents." We seek in this research to determine whether the balance of information skills has shifted to that of the reseller and the possible impact of any such change upon the quality of dyadic interaction.

Our discussion is organized as follows: in Section 2 we develop our hypotheses on the impact of power and information on intra-channel relationships. In Section 3 we describe data development. In Section 4 we present the results of our study and conclude with a discussion of findings and their implications in Section 5.

2. Power, Information and the Quality of Dyadic Relationships

Stern and El-Ansary (1992, p. 27) describe the power of a channel member as its ability to control the decision variables in the marketing strategy of another member at a different level of distribution. The power of channel member A over firm B is rooted in the dependence of B upon A (Etgar, 1976). However, this power will be moderated by that of the dependence of A upon B. Relative power, as a consequence, will be the determining factor. Farris and Ailawadi (1992) distinguish three specific power sources of retailers relative to manufacturers: i) a higher concentration of retailing buying power, ii) the access to scanner data of buyers, and iii) and the growing frequency of sales promotions which frequent retailer agreement to implement.

In food marketing channels the increasing dependence of manufacturers upon resellers provides resellers with the opportunity to exercise coercive power (e.g.,

remove items from the manufacturers from the assortment like Albert Heijn is threatening to do). Their increased capabilities of collecting data and creating information which can be used in negotiations with suppliers provides resellers with the opportunity to exercise noncoercive power (e.g., give the supplier information about customer behavior in their outlets so that promotional programs can be customized). Both sources of power are expected to have impact on the quality of the relationship.

Power Balance - Quality of the Relationship
The central question is whether resellers will exploit an improved power position by exercising power and whether such acts will affect the relationship between suppliers and resellers. Findings in the literature on this relationship have not been conclusive.

One group of authors reports a negative effect of power imbalance in the relationships and the consequent use of coercive power with deleterious effects upon the quality of the relationship. In a simulated market, McAlister, Bazerman, and Fader (1986) report that in an unbalanced condition, the more powerful channel member was able to move the agreement away from an equal profit solution to one that favored themselves. Their findings are similar to those of Dwyer and Walker (1981), who in addition found in a simulation that retailers were "...less disposed toward their partners after negotiating with a more powerful manufacturer than when power was balanced." Lusch (1976), found from interviews that power associated with coercion increased the level of intra-channel conflict. In a review article Gaski (1984) argues generally for a positive relationship is found between coercive sources of power and the level of conflict. Skinner, Gassenheimer and Kelley (1992) find that co-operation is negatively influenced by coercive bases of power and that the level of conflict is positively influenced by coercive bases of power.

Other authors are not convinced of a negative effect of coercive power sources on the quality of a relationship. Ganesan (1993) argued, and found support, for the position that conditions of high mutual dependence would result in a diminished use of noncoercive strategies. As a consequence, the presence of power in the system did not lead toward the use of strategies likely to create conflict within the dyad, but rather to the use of problem solving mechanisms seeking to resolve the joint interests of the parties. Frazier and Summers (1986) report a field study in which the results support a positive role of inter-firm power. They found that manufacturers' representatives use coercion with great reluctance and only whether other types of influence strategies have failed to produce a satisfactory response on important issues. Gundlach and Cadotte (1994) report a simulation study in which an increasing power advantage does not result in a greater use of threats and punishments.

Gaski and Nevin (1985) investigated the possibility of differential effects of

exercised, in contrast to unexercised, power sources. They find that the exercise of the coercive power source has a stronger effect on dealer satisfaction and channel conflict than the mere presence of that power source. This would mean that only having a power advantage over the other party as such would not have a negative impact upon the other party, but exercising this power would. The question then becomes when do parties start to exercise power? It might be that parties are less inclined to exercise power when the other party is powerful too. Gundlach and Cadotte (1994) find that joint dependence is associated with less frequent use of coercive strategies and lower residual conflict.

Kumar, Scheer and Steenkamp (1995) demonstrate that relationships with greater interdependence exhibit higher trust, stronger commitment and lower conflict than relationships with lower interdependence. In relationships in which both parties are powerful and become dependent upon each other, their might be a higher level of relationalism (Simpson and Paul, 1994). Simpson and Paul find that the presence of relationalism curbs the effect of increased dependence on the use of coercive power.

In the food channels that we study for this research, interdependence relative to other types of dyads is likely to be relatively weak. Numerous partners not only exist, but are employed. Retailers typically carry a number of competing brands in a category and manufacturers sell to all retailers regardless of whether they compete strongly with each other or not. In such circumstances, prior findings suggest that the presence of power in the channel may be accompanied by a greater use of coercion and a diminished quality of relationship in the channel. However, as the extent of joint dependence does increase, the extent of the use of conflict prone types of influence strategies is likely to diminish.

We derive the following hypotheses from these views:

H1a: A shift in the power balance toward the reseller will diminish reseller commitment toward the supplier.

H1b: A shift in the power balance toward the reseller will have a negative impact upon the quality of the relationship.

H2a: An increase in the total power of dyad members, reflecting increased dependence, will increase reseller commitment to the supplier.

H2b: An increase in the total power of the parties will lead to an improved relationship in the dyad.

Information Balance - Quality of the Relationship

Information as a contributor to the quality of a dyadic relationship has been addressed in a number of ways in the channel literature. Brown, Lusch, and Muehling (1983) characterized information as another base of soft (or noncoercive) power in the channel, one closely linked to that of expert power base. The use of soft bases of power was found to have limited positive impact upon exercized power and a much larger negative impact upon conflict.

In general, this positive impact for the use of soft power has typically been found in research. Lusch (1976) finds that noncoercive sources tend to decrease the level of intra-channel conflict. Gaski (1984), in a review article, shows that a negative relationship is typically found between the noncoercive sources of power and the level of conflict. Frazier and Summers (1986) expect that manufacturers with high power are better able to utilize noncoercive influence strategies effectively when overt influence attempts seem appropriate, and thereby avoid the use of coercion. This means that the use of noncoercive power might decrease the use of coercive power, thereby positively influencing the relationship. Skinner, Gassenheimer and Kelley (1992) find that cooperation is positively influenced by noncoercive bases of power while the level of conflict is negatively influenced by noncoercive bases of power. Hence, if we regard information as another form of soft power, there is a fair consensus about its impact.

Mohr, Fisher, and Nevin (1994) addressed the role of communication in the channel as having a distinct character and impact, apart from its possible linkage to expertise. They examined information in terms of its degree of collaborative orientation. In this guise, they found that "...communication that is frequent, goes in both directions, is regularly scheduled and planned, and relies upon requests and recommendations rather than threats has a strong, direct impact on enhancing channel member performance..."

Our view is that information held by the reseller is likely to be more closely related to the specific market circumstances that a firm faces. Information held by the manufacturer, while of value, has typically taken a more general character. Hence, a shift of information balance to the reseller, is likely to provide superior insight as to the effectiveness of marketing activities. Similarly, to the extent that total information capabilities of both sides of the dyad are higher, insight into both general and local conditions ought to have a positive impact upon the quality of the relationship.

From these views, we derive the following:

H3a: A shift in information balance toward the reseller will increase the level of retail commitment.

H3b: A shift in information balance toward the reseller will have a positive impact upon the quality of the relationship.

H4a: An increase in the total information held by both parties in the dyad will increase the level of reseller commitment.

H4b: An increase in the total information held by both parties in the dyad will have a positive impact upon the quality of the relationship.

In Figure 1 our research model is presented schematically. Basically, we distinguish four independent variables (power and information balance and total power and total information), an intervening variable in the form of reseller commitment

towards the relationship, and two indicators of the quality of the relationship (level of conflict and cooperation). We employ commitment as an intervening factor because of its critical importance in a dyad operation. Mohr and Spekman (1994) identify commitment as one of the primary characteristics of partnership success.

According to Dwyer, Schurr and Oh (1987) commitment refers to an implicit or explicit pledge between exchange partners. The participants have not ceased attending to alternatives, but maintain their awareness of alternatives without constant testing. Anderson and Weitz (1992) summarize commitment to a relationship as a desire to develop a stable relationship, a willingness to make short-term sacrifices to maintain the relationship and a confidence in the stability of the relationship.

We distinguish two indicators of the quality of the relationship, i.e., the level of conflict and the amount of cooperation between dyadic parties. Conflict, in its most general sense, can be thought of as overt behavior arising out of a process in which one unit seeks advancement of its own interests in its relationship with others (Lusch, 1976). We expect that the level of conflict in the relationship has a negative impact on the amount of cooperation between the two parties. Frazier (1983) states that while organisation interorganisational relationships can be characterized by conflict and cooperation simultaneously, cooperation and conflict tend to be inversely related. Frazier suggested that the resolution of conflicts leads to cooperation. Skinner, Gassenheimer and Kelley (1992) investigated this relationship empirically and found that the level of conflict had a negative impact on the level of cooperation[3].

The model in Figure 1 also reflects several other relationships that we have not identified as hypotheses above. These are the impact of commitment upon the quality of the relationship, e.g., conflict and cooperation, and the effect of conflict upon cooperation. These have been well established in the literature and need no further elaboration here.

3. Method

Data Collection

We conducted a survey among buyers of branded products sold from food chains and wholesalers in the Netherlands and Belgium. A questionnaire consisting of multiple item scales was developed to measure the subject's scores on the constructs. The questionnaire was constructed in English and tested in the Dutch translation. Furthermore, the questionnaire was translated into French for the French speaking part of Belgium.

We used both telephone and written questionnaires in order to secure the greatest possible response. Although response rates were limited by organisational control, our final sample consisted of 168 out of approximately 370 buyer names. In our

sample 122 of the buyers were employed in retailing organisations and 46 in wholesaling organisations.

Before responding to the questionnaire, buyers were requested to identify the branded product for which they had most recently purchasing contact. We placed no controls upon the supplier selection by the buyer. Buyers selected A-brands almost exclusively (about 95 percent). Although A-brands dominate the sample, initial tests show a variance in the distribution of supplier power. Subsequently, buyer's relationship with the supplier of the brand was addressed using the multiple item scale. In the middle of the questionnaire a single open ended question was used as a "breather".

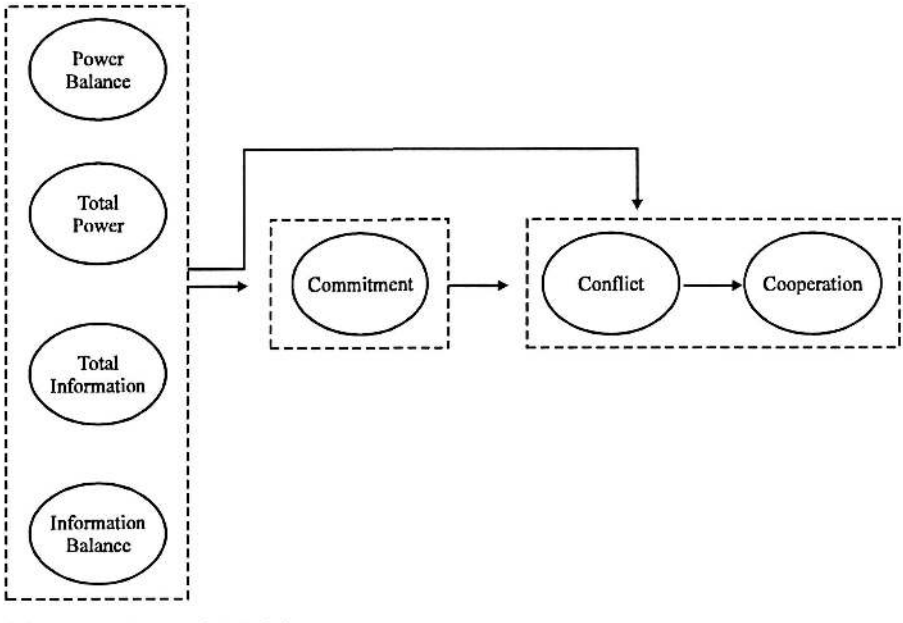

Figure 1: Research Model

Measures
We measure our constructs in the following way. The exact wording of the items can be found in the appendix.

Power: Both reseller power and supplier power were measured as the degree of dependence by the each partner (the other party) in reaching its objectives.
Information Sophistication: Both reseller and supplier information sophistication were measured as the extent of use of sophisticated sales and marketing data in negotiations with the dyadic partner.
Commitment: The degree of dedication of the resellers towards a long-term relationship with the supplier as opposed to short term benefits was measured.
Conflict: The level of conflict in the supplier-reseller relationship was measured as the extent of antagonism in the relationship as perceived by the buyers.
Cooperation: The level of cooperation between suppliers and resellers as perceived by the buyers was measured as the extent of joint problem solving.
Using LISREL 8.03 we conducted a confirmatory factor analysis to check the convergent and discriminant validity of our constructs (Anderson and Gerbing, 1988). We specified a model consisting of the seven factors. Although the χ^2 (105.98, df = 69) was significant ($p < .001$) for this factor model, the overall fit was acceptable because the Tucker-Lewis Index (.94) and the Comparative Fit Index (.95) were above the generally recommended level of .90.

All factor loadings were strongly significant. The minimum t-values was 6.29 while for most items the t-values were above 9.00. The results of our confirmatory factor analysis support the convergent validity of our items. The Cronbach α reliabilities measuring the internal consistency of our constructs ranged from .63 to .89.

Since we expected that some of our constructs might be highly correlated (e.g., retail power and supplier power, conflict and cooperation) we checked whether the correlations between these constructs were significantly different from unity. The latter appeared to be the case which demonstrates the discriminant validity of our constructs.

The basic constructs we used for our analyses were derived from the mean of the unweighted item scores. Using our basic constructs we developed two composite variables measuring the differences in resources of suppliers and resellers, i.e. *power balance* and *information balance*. Power balance was defined as the power of the buyer relative to the power of the supplier and computing by subtracting the power of the supplier form the power of the buyer. Information balance was defined as the amount of information the buyer used in the negotiations relative to the amount of information used by the supplier. It was computed by subtracting the information sophistication score of the supplier from the information sophistication score of the buyer.

Total power and *total information* were computed by adding up the scores on the power scale and the scores on the information sophistication scale of the supplier and

the reseller. In Table 1 we present the correlations between the constructs

Table 1: Correlation coefficients (significances within parentheses)

	Power Balance	Information Balance	Total Power	Total Information	Commitment	Conflict
Information Balance	.122 (.118)					
Total Power	.034 (.658)	-.019 (.811)				
Total Information	-.154 (.048)	-.044 (.577)	.128 (.101)			
Commitment	-.300 (.000)	-.027 (.729)	.049 (.535)	.270 (.000)		
Conflict	-.134 (.084)	.051 (.513)	.048 (.540)	.060 (.447)	-.103 (.187)	
Cooperation	-.095 (.222)	.018 (.821)	.016 (.841)	.159 (.041)	.377 (.000)	-.365 (.000)

4. Results

To study the impact of the power balance and the information balance constructs on the quality of the relationship we performed standard ordinary least squares, multiple regression analyses.

Power Shifts

Our results show significant impacts of changes in power in the channel upon the quality of the relationship but not to the full extent that we had expected.

In Table 2, column 1 represents the beta coefficients for the regression of the independent variables upon reseller commitment. The results show a shift in the power balance toward the reseller leads to a reduction in the degree of the latter's commitment to the dyad. However, increases in total power have no effect. Thus, hypothesis *1a* is supported, but *2a* fails. Reseller commitment is evidently sensitive to relative power in a dyad, but not total power. We had thought that the increase in the power of the two parties would have led to recognition of their need to deal with each other on a more sophisticated basis. But, this did not hold. Resellers, when their relative power increased, simply reduced their degree of attachment to the supplier. In this sense, the supplier does become more vulnerable as power moves to the reseller.

In column 2, reflecting the regression of the independent and moderating variables upon conflict, a shift in power toward the reseller has a direct effect of reducing the level of conflict. But, again there was no effect from total power. Here, hypothesis *1b* is contradicted, but *2b* fails. The contradiction of *1b* is clearly surprising. What apparently is happening is that, at least from the reseller's perspective, as power

balance shifts in its favor, the supplier becomes less demanding and demurs more to the interest of the retailer. The reseller may view this as a form of conflict reduction. Whether the supplier would find any benefit from this situation is an interesting question, but one which the data cannot answer. It should also be observed in this equation that, as one would expect, retailer commitment also serves to reduce conflict.

Table 2: Regression Results (Beta coefficients, significances within parentheses)

	Commitment	Conflict	Cooperation
Conflict	---	---	-.352 (.000)
Commitment	---	-.162 (.054)	.299 (.000)
Power Balance	-.256 (.001)	-.177 (.032)	-.029 (.691)
Information Balance	.014 (.856)	.077 (.325)	.049 (.478)
Total Power	.027 (.714)	.067 (.392)	.026 (.713)
Total Information	.226 (.003)	.076 (.355)	.097 (.185)
R^2	.14	.05	.26
Adj. R^2	.11	.02	.23

In column 3, the regression of all variables upon cooperation, no effect by either of the two power variables upon cooperation can be found. All effects in this equation derive from the dual impacts of retailer commitment and conflict which flow in the historic direction. Hence, hypotheses *1b* and *2b* receive no support.

Information Shifts

From the first column of Table 2, we see that increases in the total information capabilities of the two parties have a strong impact upon retailer commitment. It is possible here that some of the results identified by Mohr, Fisher, and Nevin are being echoed here. Increases in total information suggest that both parties are becoming more sophisticated in the use of data collection skills and their interpretation. This may lead to a greater ability for the parties to function well together and to higher reseller commitment. Increases in the relative role of the reseller's information skills appears to have no effect at all. Hence, hypothesis *3a* fails, but *4a* is supported. In the remaining two equations, no effects from either aspect of information are identified. Hence, hypotheses *3b* and *4b* also fail.

5. Conclusions and Discussion

In this paper we investigated the impact of changes in power and information upon the quality of supplier-reseller relationships in food marketing channels. We expected that a shift in the power balance toward the reseller would diminish the quality of the relationship. The results were by no means so simple.

When the reseller relatively increases its power, this middleman becomes less committed to its supplier. However, as we see in the equation in Table 2, there is a significant negative association between retail commitment and conflict. While this latter finding is to be expected, it signals that the indirect effect of power balance upon the quality of the relationship is negative. That is, the impact of less supplier power in the relationship creates conflict because the reseller is more indifferent.
However, at the same time there is as direct negative impact of power balance upon conflict. This leads to the conclusion that there are apparently two separate effects from the supplier's loss of a power position. One increases conflict, but the other serves to diminish this response. In terms of conflict alone, the final outcome is an unambiguous improvement in this relationship. However, this may be of limited comfort to the supplier since the retailer may now be more indifferent to the supplier and that the supplier may have been forced to become more deferent toward its stronger partner.

A similar, conflicting pattern appears with respect to the dyadic characteristic of cooperation. With a reduction in reseller commitment, the level of cooperation in the dyad diminishes. Reduced conflict shows the opposite effect, enhancing cooperation. From the perspective of cooperation, it appears that the two forces may cancel each other out. However, as in the case of conflict, we have concern that the loss of retail commitment causes the result to be weaker than it appears.

We also investigated the impact of the use of information in negotiations by resellers and suppliers. Our results show a much more limited role compared to that of power. We found only that there was an increase in reseller commitment when the total information sophistication of both parties in the dyad increased. Shifts in information sophistication to the reseller alone had no impact in any of the equations. However, the strong positive impact of total information sophistication is an important finding.

The indirect effects of greater dyadic information sophistication lead to a reduction in conflict and an increase in cooperation among the parties. Conflict is reduced because of the higher reseller commitment. Lower conflict and higher reseller commitment, in the form of the direct effect, result in greater cooperation. The results are unambiguously positive. Hence, to the extent that a supplier finds its position weakened because of a shift in power toward the reseller, there is an opportunity to recoup reseller commitment through the development of improved information sophistication. Thus, increased emphasis upon providing the reseller with improved information, and aiding the reseller in improving its own information capabilities, may

provide the strategic path for suppliers to travel in a period of shifting channel power.

Overall, our findings provide further indication of the importance of commitment in the management of the distribution channel. Gundlach, Achrol and Mentzer (1995) hold that commitment is an essential part of successful long term relationships. Our data move beyond this finding by showing that commitment moderates in key ways the impact of both power shifts and information skills. A reduction in a power position is likely to trigger a contraction in the commitment to the relationship held by the other party. This may be mitigated by simultaneous reductions in conflict, however, we are somewhat dubious about the strength of this offset. More importantly, our data show that one way out of this problem for suppliers is through increasing their information skills and leading the dyad to greater ability to derive insight into market forces.

Notes

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[3] In this study we assume conflict to be dysfunctional in the sense of having a negative impact upon cooperation. As one of the editors mentioned, there are also instances in which conflict is functional in strengthening the relationship. Stern and El-Ansary (1992, p. 314) mention that "..conflict can be a positive social force that breeds adaptation and innovation. However, it must be managed, because it can prevent a system from achieving effectiveness and efficiency in providing service outputs..".

Appendix: Scale items

Reseller Power $\alpha = .72$
- If we drop this brand, the supplier will sell more through our competitors (R)
- Our Customers will shop for this brand elsewhere if we do not have it in stock (R)

Supplier Power $\alpha = .80$
- If we drop this brand, it will be difficult to replace its sales by products from other suppliers
- If we lose the ability to carry this brand, we will suffer a significant reduction in profit
- If we do not carry this brand, our customers will be unhappy with us

Reseller Information Sophistication $\alpha = .63$
- In negotiations about this brand, I regularly use data that reveal the effectiveness of his promotional activities upon retail sales
- In negotiations, I regularly use computer programs to evaluate the success of promotional activities suggested by this supplier for his brand

Supplier Information Sophistication $\alpha = .89$
- In discussing previous promotional activities for this brand, this supplier regularly uses computer evaluations derived from scanner data
- In discussing promotional activities for this brand, this supplier regularly presents computer predictions derived from scanner data

Commitment $\alpha = .79$
- We have invested a great deal to build a long term relationship with this supplier
- With this supplier, it is important we focus upon building a long term relationship even though this may require short term sacrifices

Conflict $\alpha = .86$
- Negotiations with the supplier for this brand are sometimes hostile and lack mutual understanding
- My company's relationship with this supplier for this brand is characterized by a great deal of conflict

Cooperation $\alpha = .70$
- When we experience problems or difficulties with this brand, the supplier is responsive to our needs
- This supplier works closely with us to be sure that the support they provide for this brand meets our specific needs

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HEDGING RISK IN AGRICULTURAL FUTURES MARKETS 7

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1. Introduction

Futures contracts are potential price-risk management instruments for farmers. While much research has been done on the valuation of these instruments, little is known about the risks of using futures contracts. When hedging, farmers must be aware of these risks associated with hedging which we analyze in this article. By analyzing the capacity of futures contracts for reducing risk, we provide both the management of the futures exchange and the hedger a better understanding of the pro and cons of futures contracts as instruments for price-risk reduction.

There are two general sources of risk to farmers[2], quantity risk and price risk. Quantity risk is a farm-specific phenomenon caused by a myriad of random factors such as, disease and weather conditions. Price risk is a market phenomenon caused by random changes in the aggregate quantity of a good demanded or supplied (Dwight, 1985). This article focuses on price risk. This type of risk has become more relevant to farmers in both the United States (U.S.) and the European Union (E.U.) because of the free-trade policy of GATT and reforms in the common agricultural policy of the E.U.

Because of increased fluctuations in agricultural prices, some exchanges are creating new futures contracts. Recently, the Marché à Terme International de France in Paris and the Amsterdam Agricultural Futures Exchange have introduced rapeseed futures contracts and wheat futures contracts, respectively. On the one hand, price risk in the cash market can be decreased using futures, while on the other hand, futures generate additional risks. Understanding the capacity of futures to reduce overall risk is important. (Jolly, 1983; Bosch and Johnson, 1992). Actually, the lack of understanding by farmers and firms, in general, about how to use futures has caused many failures in price-risk management (Figlewski, Landskroner and Silber, 1991; Edwards and Canter, 1995).

The contribution of this article on price-risk management by farmers is two-fold.

First, in contrast to other studies, this article takes into account that futures not only reduce cash price risk but also introduce hedging risk[3]. This element of hedging efficiency has a great influence on the capacity of the futures contract to eliminate overall risk. Second, hedging risk is analyzed in all of its components. Furthermore, the influence of the interaction between those components on the hedging risk is examined.

The paper is organized as follows. First, a general framework of hedging efficiency is proposed. Second, the risks introduced by futures are analyzed. In order to illustrate how large the hedging risk can be for farmers using futures, the hedging risk for the potato futures contract traded on the Amsterdam Agricultural Futures Exchange is measured.

2. Hedging Efficiency

Three hedging theories can be distinguished. First, traditional hedging theory emphasizes the potential of futures markets to avoid risk: cash positions are hedged by taking an equal but opposite position in the futures market. A second theory (Working, 1962) suggests that hedgers operate like speculators, being primarily interested in relative prices rather than absolute ones. According to Working, holders of a long position in the cash market hedge if they expect the basis to fall, but not when a rise is expected. The latest and the most common theory nowadays is the portfolio approach. In this approach the risk of price changes is introduced into the hedging model by a variance function. Moreover, a frontier is traced, showing a relationship between variance and expected returns.
The recently proposed measures of hedging effectiveness are based on the third hedging approach mentioned above. Several studies (e.g., Ederington, 1979; Franckle, 1980; Hill and Schneeweis, 1982; Wilson, 1984; Howard and D'Antonio, 1984; Chang and Shanker, 1986; Overdahl and Starleaf, 1986; Lindahl, 1989; Chang and Fang, 1990; Gjerde, 1987; Pirrong, Kormendi and Meguire, 1994; Hsin, Kuo and Lee, 1994) describe the usefulness of trading a futures contract by comparing the results of a combined cash-futures portfolio and the cash position only.

Ederington (1979) defines hedging effectiveness as the reduction in the variance of returns. The objective of a hedge is to minimize the risk of a given position. This risk is represented by the variance of returns. Howard and D'Antonio (1984) derive a measure of hedging effectiveness that incorporates both the minimization of risk and maximization of the excess return (e.g., Chang and Shanker, 1986; Lien, 1993). Hsin, Kuo and Lee (1994) measure hedging effectiveness as the difference in the certainty equivalent returns between the hedged position and spot position. This approach considers both risk and returns in hedging. They argue that the advantages of their measure are that it considers both risk and expected returns and that it is consistent regardless of the empirical expected changes in spot prices.

These measures are concerned with the minimizing the risk of the portfolio of the spot commodity and the futures contract or finding an optimal balance between risk and return. All these measures implicitly assume that the futures contract is perfect, i.e., introduces no risks. However, futures contracts do introduce risks which have an impact on the variance of the hedger's returns. Furthermore, these risks affect the success of a futures contract and are, therefore, of great interest both to the management of the futures exchange and the hedger (Black, 1986).

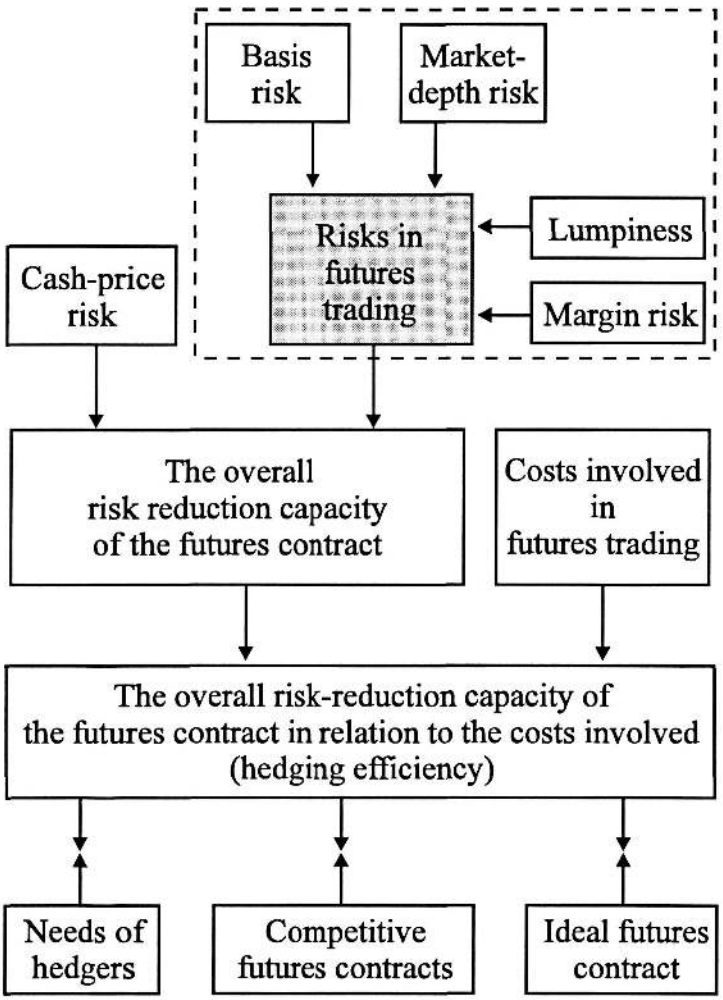

Figure 1: Proposed concept of Hedging Efficiency

A futures contract which establishes a certain price without introducing other risks best fulfills the hedger's need for hedging. However, the hedger will not always use

this particular futures contract, since the decision is also influenced by the cost involved in futures trading, i.e., commission costs and margin requirements.

The hedger will weigh the costs involved in futures trading against the satisfaction he derives from the futures contract. Therefore, we propose to define hedging efficiency as the capacity of the futures contract to reduce the overall risk in relation to the cost involved in futures trading. It is important for both the futures exchange and the hedger to know how well the services provided by the futures contract meet the needs of the hedger. The proposed concept of hedging efficiency assesses how well the futures exchange is able to achieve this goal. Figure 1 illustrates our concept of hedging efficiency.

The capacity of the futures contract to reduce total risk in relation to the trading costs involved is the hedging service which the futures exchange provides. Two factors are important for the futures exchange: whether it meets the need of the hedgers with respect to overall risk reduction, and whether it can compete on that point with competitive futures exchanges. In this article, we elaborate on the futures trading risk, i.e., the upper-left part of Figure 1 denoted by the dotted line.

3. Risks in Futures Trading

Because the futures market offers a price-risk-management service, this service preferably should not generate additional risk. When the futures market introduces no hedging risk we refer to the futures contract as a perfect futures contract which generates a price for the short hedger in period $t+1$ of:

$$[1]\quad ARP_{t+1} = CP_{t+1} + (PF_t - PF_{t+1} - TC) = PF_t - TC$$

where ARP is the actual realised price, CP the local cash price, PF the futures price, $PF_t - PF_{t+1}$ the liftings value and TC the roundturn brokerage costs[4].

However, in practice we observe that the actual price realised ARP_{t+1} is often not equal to the net futures price $PF_t - TC$ for which the hedger enters the futures market. Hence, the hedger is exposed to hedging risk, where hedging risk is defined as the distance between the price for which the hedger enters the futures market corrected for transaction costs, $PF_t - TC$, and the actual price after the hedger has liquidated the futures position, ARP_{t+1}, regardless of whether this distance is positive or negative (Camerer and Kunreuther, 1989).

Hedging risk can be broken down into the following elements: basis risk, lumpiness, market-depth risk and margin risk. These elements are analyzed for hedging price risk for farmers.

3.1. Basis Risk

It is generally recognized that futures markets can be used by farmers to hedge the risks associated with price fluctuations in the underlying spot market (Grossman, 1986). Any deviation in the cash-futures-price relationship at the settlement date will be eliminated. However, if the arbitrage transaction costs are high, the necessary convergence of the cash and futures prices will be countered, thereby introducing a risk to the hedger and negatively affecting participation in futures markets. The basis between a futures contract and its underlying commodity is an important measure of the cost of using the futures contract to hedge. In a cross-hedge, the relative size of the basis of alternative hedging vehicles often plays a decisive role in the selection of the optimal hedging vehicle (Castelino et al., 1991). Basis risk is attributed to location, quality and timing discrepancies between commodities traded in the cash market and those deliverable on futures (Paroush and Wolf, 1989). In the case of futures indexes, unanticipated variation in dividends may involve basis risk (Figlewski, 1984; Brennan and Schwartz, 1990). The unpredictability of the basis presents hedgers with a risk that is unhedgable, as is outlined by Figlewski (1984) and Brennan and Schwartz (1990). Explanations for the variability in the basis include the marking-to-market requirement for futures contracts, the differential tax treatment of spot and futures, as well as the difficulties in arbitrating between large cash positions and futures. Kumar and Seppi (1994) find that arbitrage reduces basis volatility.

The existence of basis risk, which is specific to futures markets and does not exist in cash forward markets, introduces an element of speculation in the sense that hedgers are still exposed to this risk while hedging their physical commodity. In a recent article, Netz (1996) shows that basis risk not only affects the futures position but also the cash-market position for all hedging by risk-averse agents. Numerous articles provide statistical models for predicting the basis (Naik and Leuthold, 1988; Trapp and Eilrich, 1991; Liu et al., 1994), although researchers find it difficult to forecast.

3.2. Lumpiness

Farmers can specify forward contracts which correspond with the quantity they have available for sale, in contrast to futures contracts which are traded in standard quantities. Therefore, a futures hedge may not exactly match the amount of the desired sale or purchase, and lumpiness causes a proportion of the cash position to remain exposed to uncertain changes in price. As the quantity to be hedged increases, the relative importance of lumpiness declines and ultimately approaches zero.

3.3. Market-depth Risk

Market-depth risk is the risk the hedger faces from a sudden price decrease or increase due to order imbalances; this risk seems important to systematic hedgers, particularly in thin markets. Kyle (1985) defines market depth as the volume of

unanticipated order flows which move prices by one unit. Sudden price changes may occur in cases of both long and short hedges. If a relatively small market sell (buy) order arrives, the transaction price is the bid (ask) price. For a relatively large market sell (buy) order, several transaction prices are possible, at lower and lower (higher and higher) prices, depending on the size of the order and the number of traders available. If the sell order is large, the price should continue falling to attract additional traders to take the other side of the order. Given a constant equilibrium price in a deep market, relatively large market orders result in a smaller divergence in transaction prices from the underlying equilibrium price than in a thin market. The generally known factors which determine market depth, and in general liquidity, include: the amount of trading activity[5] or the time rate of transactions during the trading period; the ratio of trading activity by speculators and scalpers to overall trading activity; equilibrium price variability; the size of a market order (transaction); expiration-month effect; and market structure[6] (Black, 1986; Thompson and Waller, 1987; Christie and Schultz, 1994; Chan and Lakonishok, 1995; Christie and Schultz, 1995). According to Lippman and McCall (1986) the deepness of the market for a commodity increases with the frequency of offers. Hasbrouck and Schwartz (1988) report a relation between market depth and trading strategies of market participants. Passive participants wait for the opposite side of their trade to arrive, but the active ones seek immediate transaction. Passive participants may avoid depth costs, whereas active ones generally incur depth costs. Some exchanges monitor temporary order imbalances, i.e., market-depth risk, and slow down the trade process if these are present (Affleck-Graves, Hegde and Miller, 1994). For example, an order-book official issues warning quotas when trading results in price changes that are larger than minimums allowed by the exchange and halts trading when order execution results in price changes that exceed exchange-mandated maximums (Lehmann and Modest, 1994). Market-depth measures are rather scarce. Brorsen (1989) uses the standard deviation of the log price changes as a proxy for market depth. Lehmann and Modest (1994) study market depth by examining the adjustment of quotas to trades and the utilization of the *chui kehai* trading mechanism on the Tokyo Stock Exchange, where the *chui kehai* are warning quotas when a portion of the trade is executed at different prices. Utilizing the *chui kehai* trading mechanism can give an indication of market depth, but cannot be used to measure it. Other researchers, such as, Bessembinder and Seguin (1993), use both price volatility and open interest as a proxy for market depth. In general, an individual farmer who manages a family farm needs only a few futures contracts to hedge his underlying cash position because of the large size of the futures contract relative to the cash position. For that reason, the market depth costs are probably relatively small. However, for traders or cooperatives that wish to hedge price risks on behalf of a group of farmers, market depth costs may be large. Farmers can eliminate market depth costs if they give orders with limit prices to a broker. However, if they use limit prices, farmers may run the risk that their trade cannot be executed.

3.4. Margin Risk

The net cost arising from futures margin requirements consists of the opportunity costs of the initial margin requirement and the opportunity cost of marking to market (i.e., marking to market means that if futures prices fluctuate, those who hold losing positions must add to their margin accounts, while winners may withdraw their surpluses). Farmers holding losing positions incur actual and opportunity interest costs. These income and cost flows compound over the span of the futures hedge. The margin cost is more significant if the time horizon of the hedge increases. Thus, futures in agricultural commodities with relatively long growth and storage periods, such as, potatoes (with a time horizon of about one year), incur more margin costs than hogs, where there is no storage period and the growth period is short (with a time horizon of about three months).

3.5. Model

In order to gain insight into the consequences of hedging risk for the farmer, a microeconomic approach is adapted to hedging. In this article, risk is measured by the variance which is a measure of how much the outcomes vary or differ from one another. Hence, the variance corresponds exactly with (hedging) risk as defined at the beginning of this section.

Consider a farmer who systematically hedges his output and intends to sell the output in period T on the cash market. The farmer can now use futures based on different strategies to manage price risk. The strategy of a farmer depends on whether the desired time period T equals the maturity of the futures M. If $T = M$, the farmer offsets his position and sells the commodity in the cash market or he holds the position and makes delivery[7]. Whether the farmer offsets his position or makes delivery depends on the standardization requirements, the search cost in the cash market, and the market-depth cost in the futures markets. If $T \neq M$, the farmer can only liquidate his position by offsetting the original futures contract. Figure 2 depicts the decision tree of the farmer for hedging output with futures.

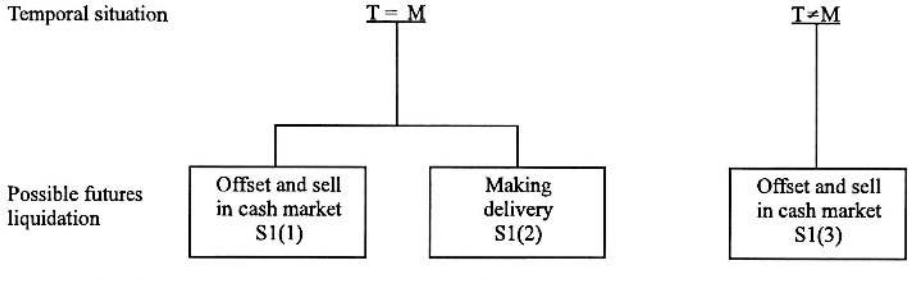

Figure 2: Hedging strategies in the case of futures.

The revenue of a farmer who hedges his output when the delivery date for the commodity equals the maturity date of the futures can be expressed as:

$$[2]\ \tilde{\Pi}_1 = n(PF_t - \tilde{C}P_T) + (q-n)\tilde{C}P_T + n\tilde{C}P_T + n\tilde{B}_T^{sq} - n\tilde{M}DC - nTC - I^{\in} - n\tilde{I}^{mm}$$

where Π_1 is the revenue at the end of the period when the delivery date for the commodity equals the maturity of the futures, n is the futures quantity sold, q is the output produced, B_T^{sq} is the spatial and quality dimensions of the basis at the end of the period, MDC the market-depth costs, $I^{\in}$ is the initial margin costs and I^{mm} is the marking-to-market costs. A tilde (~) denotes a random variable. Lumpiness is expressed as $q-n$, i.e., the quantity which cannot be hedged because of the standardized units of the futures contract.

We assume that the farmer wishes to hedge his underlying cash position completely. It can be shown that a full hedge is not always optimal for the hedger. However, for simplication, we assume a full hedge, which does not affect our conclusions.

The revenue of a farmer who hedges his output when the delivery date of the commodity is unequal to the maturity date of the futures can be expressed as:

$$[3]\ \tilde{\Pi}_2 = \tilde{\Pi}_1 + \tilde{n}B_T^{tem}$$

where Π_2 is the revenue at the end of the period when the delivery date for the commodity is unequal to the maturity date of the futures contract, and B_T^{tem} is the temporal dimension of the basis.

To determine the hedging risk, it is necessary to determine the covariance matrix of the stochastic variables contributing to the hedging risk. The covariance matrix can be represented by:

$$\Omega = \begin{pmatrix} \sigma^2_{CP} & \sigma_{CP,B^{sq}} & \sigma_{CP,B^{tem}} & \sigma_{CP,MDC} & \sigma_{CP,I^{mm}} \\ \sigma_{B^{sq},CP} & \sigma^2_{B^{sq}} & \sigma_{B^{sq},B^{tem}} & \sigma_{B^{sq},MDC} & \sigma_{B^{sq},I^{mm}} \\ \sigma_{B^{tem},CP} & \sigma_{B^{tem},B^{sq}} & \sigma^2_{B^{tem}} & \sigma_{B^{tem},MDC} & \sigma_{B^{tem},I^{mm}} \\ \sigma_{MDC,CP} & \sigma_{MDC,B^{sq}} & \sigma_{MDC,B^{tem}} & \sigma^2_{MDC} & \sigma_{MDC,I^{mm}} \\ \sigma_{I^{mm},CP} & \sigma_{I^{mm},B^{sq}} & \sigma_{I^{mm},B^{tem}} & \sigma_{I^{mm},MDC} & \sigma^2_{I^{mm}} \end{pmatrix}$$

where σ^2_x represents the variance of the random variable x, and σ_{xy} represents the covariance between the random variables x and y.

By letting $b' = (q - n, n, -n, -n)$, the variance of the revenue can be expressed as:

$$\sigma^2_{\Pi_2} = b'\Omega b .$$

The covariance matrix provides insight into the underlying structure of hedging risk. If there is no lumpiness, i.e., n equals q, the influence of cash-price uncertainty can be entirely eliminated. Thus, for large farmers and cooperatives which represent a group of farmers, the lumpiness will not be large. However, if a large farmer or cooperative enters the market with many contracts, in contrast to a small farmer who enters the futures market with only a few futures contracts, they may face market-depth-cost risk. With a large cash-market position and, hence, many futures, the cash-price risk caused by the lumpiness is relatively low, but the market-depth-cost risk may be relatively high. Knowing the characteristics of the underlying structure of market-depth cost is helpful in order to reduce this risk (Pennings et al., 1996).

The interaction between the components of the hedging risk are represented by the covariances. For the hedger it is important to understand the interactions between the hedging risk components. For example, from a theoretical point of view, it is expected that the covariance between the basis (both the temporal dimension and spatial and quality dimension) and the market-depth costs influence the variance of the revenue when the futures market is relatively thin and the underlying commodity of the futures contract is not exactly equal to the cash position of the hedger. An example makes this clear. Suppose a potato producer goes short the April 1996 contract traded on the Amsterdam Agricultural Futures Exchange at 30 Dutch Guilders. Now, suppose that in April 1996 when he enters the market to lift his hedge, the current basis is 0.5 Dutch Guilders. He buys to cover his short position, and because of a lack of market depth, the transaction pushes the price upward, so that the actual basis is 0.1 Dutch Guilders. Thus, the market-depth-cost risk has actually decreased the hedging risk and, hence, improved the hedging effectiveness (Pennings and Meulenberg, 1997).

The covariance matrix not only provides information for hedgers but also for the management of the futures exchange. The futures exchange has tools, such as the futures contract specification and the trading system, which may affect the elements of the covariance matrix thereby affecting the hedging efficiency (Pennings and Meulenberg, 1997). For example, the basis may, to some extent, be managed by the futures exchange. A futures contract specification which resembles the cash position reduces basis risk. The futures exchange can also reduce market-depth risk by using a mechanism to slow down the trading process if order imbalances occur and to attract market depth by reporting these. Also, order book information may be improved; one mechanism that allows potential participants to view real-time limit orders, by displaying the desired prices and quantities at which participants would like to trade, affects market depth because participants can now observe how many contracts can be traded at the quoted price. We conclude that insight into the covariance matrix provides the hedger information about the risk he is facing when

using futures and provides the management of the futures exchange with insight into their hedging services. To determine the hedging risk for potato growers, we conducted a simulation by applying our model to data from the Amsterdam Agricultural Futures Exchange.

4. Empirical Illustration

The hedging risk is measured using data on the potato futures contract traded at the Amsterdam Agricultural Futures Exchange (ATA). The potato futures contract is a relatively successful. In fact, the volume generated is large relative to competitive potato futures contracts in Europe. With the aid of transaction-specific data, it was possible to measure the hedging risk run by trading potato futures contract for delivery April 1996. Because only transaction-specific data for period February 1995 to June 1995 were available, the time horizon of the simulation was limited. Thus, no distinction could be made between the temporal basis and the spatial and quality basis. The period captured the preharvest period for potato growth and the marketing cycle. This implied that the basis between the cash prices for February to June 1995 and the price of futures for April 1996 included the full storage costs for the harvest period of September 1995 to April 1996. Therefore, changes in the basis in the sample period are not due to changes in storage costs. It is assumed that the estimated variance between the cash price and of the basis in the sample were constant over time because these are characteristics of the market.

The covariance matrix Ω was calculated using the Rotterdam potato cash prices, the closing prices for potato futures and on the basis of transaction-specific data collected by the clearing corporation. The market-depth costs for an order selling imbalance were calculated as the area between the downward-sloping price path and the price for which the hedger enters the futures market,

$$[4] \quad MDC = PF^1 * N - \sum_{i=1}^{N} (PF^i)$$

where PF^1 is the futures price for which the hedger enters the market and N the total order flow.

The market-depth costs for an order buying imbalance were calculated as the area between the upward-sloping price path and the price for which the hedger enters the futures market,

$$[5] \quad MDC = \sum_{i=1}^{N} (PF^i) - PF^1 * N$$

From the data, it was impossible to infer the exact split between an increasing and decreasing price path, since prices were constant for several contracts in the local minimum or maximum. Therefore, we followed the following procedure: for an odd number of intersecting contracts we used the middle contract, whereas for an even number of constant contracts a random assignment with equal probabilities was used

to determine the split. Subsequently, all order-specific market-depth costs were converted into daily market-depth costs per futures contract. The margin costs depend on the price of the futures contracts sold. The margin costs were calculated for several prices on the basis of an interest rate of 5% for borrowing and an interest rate of 4% for investing.

The amount of output which the farmer wishes to hedge q, the output produced n and the price which the farmer has locked in the futures market PF were specified *ex ante* (see Table 1).

Table 1: Research design for calculating the variance of returns in case of price risk management by futures for different values of the futures position n, cash position q and futures price PF.

n	q	PF
n_1=1	q_1=1	PF_i=23, 24, 25, 26, 27, 29, 31, 33, 35, 40, 45, 50, 55, 60, 65, 70, 75
n_2=1	q_2=1.5	PF_i idem
n_3=10	q_3=10	PF_i idem
n_4=10	q_4=10.5	PF_i idem

Four combinations of n and q were examined to investigate the sensitivity of the results for lumpiness. For every combination of n and q, seventeen different futures price levels for which the farmer enters the futures market were looked at. Table 1 summarizes the combinations of n, q and PF used in the analysis.

4.1. Results

The variance per futures contract is given in Figure 3. The results of our simulation suggest that the effect of lumpiness on the hedging risk of the potato futures contract decreases when the output that a farmer wishes to hedge increases. Furthermore, the hedging risk does not significantly depend on the price at which farmers enter the futures market. Thus, the market-depth risk in the potato futures market is relatively low compared with the cash-price risk and basis risk. This result is in accordance with previous research where it was concluded that the potato market is relatively deep with respect to other futures contracts, such as, hogs futures which are on the ATA also traded (Pennings et al., 1996). The covariance matrices suggest that the variance introduced by the potato futures can be attributed mainly to attributed to the basis.

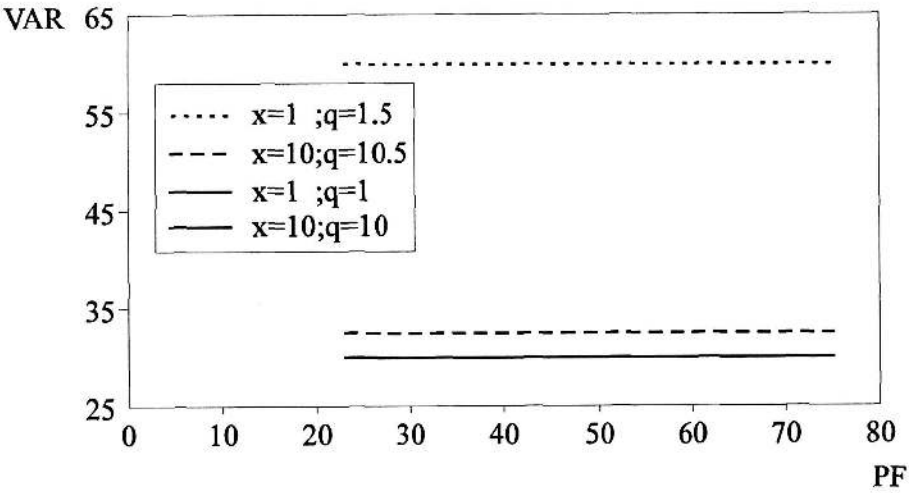

Figure 3: Variance introduced by the potato futures contract traded at the Amsterdam Agricultural Futures Exchange.

From the empirical results, we conclude that futures introduce risk which must be taken into account by farmers who manage price risks. Farmers can reduce those risks, especially risks due to lumpiness, by not hedging their cash position individually, but by jointly hedging the cash positions of a group of farmers. An agricultural cooperative could do so by trading futures for a group of farmers.

Although the benefits associated with risk reduction are important factors in motivating the farmers to engage in futures trading, we are aware that potential users may also be heavily influenced by their subjective assessments of the performance and reliability of a futures market as outlined by Ennew et al. (1992).

5. Conclusions

As agricultural markets become freer, price volatility will increase, and thus, the need for hedging will increase. The increased opportunities for farmers to manage risk by using futures require a better understanding of the risks involved. In contrast to earlier research, we examined the decrease in both price risk through hedging as well as risks that futures introduce. Hedging with futures may lead to temporal basis risk, spatial and quality basis risk, market-depth risk, marking-to-market risk and lumpiness. These risks are particularly important to farmers hedging their output on new and small futures exchanges. The empirical results show that the hedging risk in the potato futures market in Amsterdam decreases when more futures are used. Hence, farmers who cooperate in hedging their potatoes bear less risk than farmers

who trade separately. The price for which the farmers enter the market has almost no effect on hedging risk, i.e., marking-to-market risk was relatively low. Further research which includes other price-risk-management instruments is clearly called for in order to deepen the understanding of the risks introduced by those instruments and, hence, to provide insight into the optimal price-risk management strategies for farmers. Research which takes subjective performance into account is in progress.

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We are indebted to the Amsterdam Agricultural Futures Exchange (ATA) and the Clearing Corporation (NLKKAS), especially to Rolf Wevers, for invaluable data. Furthermore, we are indebted to the board of directors of the ATA for helpful comments on an earlier draft. The authors are responsible for remaining errors.

Notes

[1] Department of Marketing and Marketing Research, Wageningen Agricultural University, The Netherlands.

[2] Note that the words farmer and hedger are used interchangeably

[3] Note that the words hedging risk and futures trading risk are used interchangeably.

[4] We could equally well have used a long hedger in this example, because a distinction is not essential for the derivation of the hedging risk.

[5] In the literature, trading activity is often used as an indicator for market liquidity. However, Park and Sarkar (1994) showed that, in the case of the S&P 500 index futures contract, changes in trading activity levels may be poor indicators of changes in market liquidity.

[6] This is not meant to be exhaustive.

[7] Making delivery on a futures is only possible when the cash position of the farmer is equal to the underlying commodity of the futures, which is seldom the case.

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PART 3

DYNAMICS IN CONSUMER BEHAVIOR

DYNAMICS IN CONSUMER BEHAVIOR WITH RESPECT TO AGRICULTURAL AND FOOD PRODUCTS

8

Jan-Benedict E.M. Steenkamp[1]

1. Introduction

Food has a central position in the life of consumers. It is the source of nutrition and hedonic experiences, it serves a social and cultural function, and accounts for a major share of consumer expenditure. Yet consumer behavior with respect to foods has not attracted much systematic attention by consumer behavior researchers. At least part of the difficulty in conducting research in this important area lies in the complexity and diversity of the influences at work in food choice and consumption, and in the fact that such research requires knowledge of the concepts of and insights from a wide range of science and social science disciplines, including food science, nutrition, medicine, psychology, physiology, psychophysics, sociology, economics, marketing, and anthropology.

The purpose of this paper is to present an interdisciplinary overview of the literature on the dynamics of food consumer behavior. Given the huge body of literature, no claim can be made that this overview is complete. However, a number of key findings from various disciplines will be reviewed. Given the rapid globalization of the marketplace, special attention will be given to cross-national differences in various aspects of food consumer behavior.

2. A model for consumer behavior with respect to foods

Figure 1 shows a conceptual model for consumer behavior with respect to foods. This model will be used as an organizing framework to structure the literature in this area. The model distinguishes between the consumer's decision process with respect to foods, and the factors influencing this decision process. Four stages are identified in the consumer decision process: need recognition, search for information, evaluation of alternatives, and choice. These phases are derived from standard models of consumer behavior (e.g., Engel et al., 1995).

Several models of factors affecting the behavior of individual food consumers have been proposed in the literature. One of the earliest and most influential models was proposed by Pilgrim (1957). In his model, food acceptance is dependent on perception. Food perception is a function of three factors: 1) physiological effects of the food, 2) perception of sensory attributes, and 3) influences from the environment. Pilgrim hypothesized that these determinants interact in influencing food choice, but he did not explore these interrelations. His model also incorporates the time factor, with external influences being either recent or long established, and with some physiological influences being relatively stable for an individual, while other influences will vary over short periods with ingestion of foods (e.g., hunger).

Pilgrim's model served as point of departure for many subsequent models of factors affecting food acceptance and behavior (see Shepherd, 1990, for an overview). Although some differences can be observed between these models, they generally distinguish between three types of factors: 1) properties of the food, 2) factors related to the person engaged in food consumption, and 3) environmental factors. This categorization scheme is also used in our model of the food consumer. It is acknowledged that the boundaries between the three groups of influencing factors are fuzzy, and that mutual influences occur. Thus, any comprehensive analysis of consumer behavior with respect to foods must consider all three types of factors.

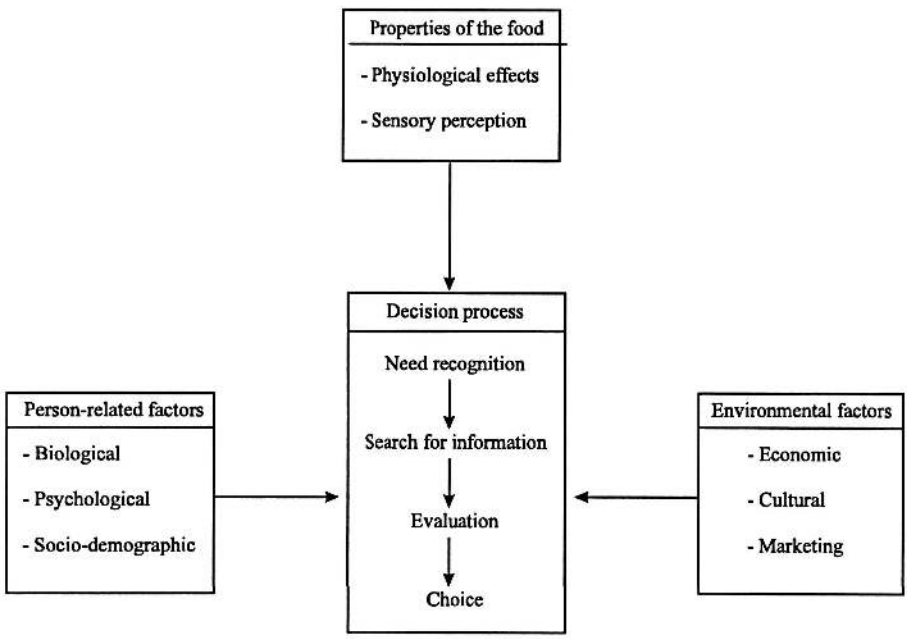

Figure 1: Conceptual model for consumer behavior with respect to food

Figure 1 identifies a number of specific variables relating to each group of factors. Properties of the food include physical and chemical properties, and nutrient content, such as physical form, proportions of macronutrients, amount of fiber, energy value, and amounts of specific substances (sugar, salt, seasoning, etc.). These food properties affect consumer behavior through their physiological (e.g., hunger, satiation, appetite) and sensory effects. Factors related to the person include biological factors (e.g., age, sex, body weight), psychological factors, and sociodemographic factors. Environmental factors include economic, cultural, and marketing factors. Although the three types of factors will interact, this paper will discuss each group of factors separately to keep the presentation manageable and because most research evidence concerns the effects of a single type of determinants in isolation. Future research should take a more comprehensive approach, as will be detailed in the last section of the paper.

In the remainder of the paper, we will first discuss the four stages of the consumer decision process with respect to foods, and next explore the effects of properties of the food, person-related factors, and environmental factors on the decision process. Finally, a number of trends in cross-national consumer behavior are identified, and some issues for future research are provided.

3. Consumer decision process with respect to foods

3.1. Need recognition

A need arises when there is a discrepancy between the desired and the actual state of being. A variety of factors affects the actual state. A major cause of a change in the actual state is depletion of the available supply of the food product. Need recognition can also be triggered by dissatisfaction with the current product; the product can be spoilt, or its quality fails to meet expectations. Consumers may also experience a need for stimulation, because their activation level has fallen below acceptable levels (Steenkamp et al., 1996).

The desired state of affairs can also be affected in various ways. Influences such as culture, subculture, or lifestyle trends, or changes in sociodemographic characteristics (e.g., birth of a child) can cause a change in a consumer's desired state. Another key factor is new product experiences. The market success of green pepper, courgette, eggplant, and other vegetables in Northern Europe is, at least partially, due to the positive experiences consumers had with these products as tourists in Southern Europe.

Marketers can stimulate need recognition by advertising, in store-promotions, and by ensuring adequate shelf space so that the consumer recognizes the product in the supermarket. Marketing activities primarily serve to remind the consumer that he or she may need this product, but are less effective in creating needs.

3.2. Search for information

The next stage in the consumer's decision process involves searching for information about alternative solutions. The most important information source is consumers' previous experience with the food product (Steenkamp et al., 1986a). External search for information about foods is in general limited. In a study concerning purchase decisions for cereal, coffee, margarine, and toothpaste, it was found that, on average, consumers took less than 12 seconds in making each purchase decision. Nearly half spent five seconds or less (Dickson and Sawyer, 1990).

Research has shown that the extent of external information search is inversely related to prior purchase experience, involvement with the product category, time pressure, quality variation between product alternatives, and stability of the product category (see Engel et al., 1995, for a review). All these factors tend to inhibit extensive search for information in the context of food products. Prior purchase experience is typically high, involvement relatively low, time pressure high, quality variation rather low, and there are comparatively few major product innovations or price changes (as compared to other product categories such as cars or electronic equipment).

3.3. Evaluation of alternatives

In this stage, different product alternatives that may satisfy the same need are evaluated. The consumer has to decide upon the criteria on which the alternatives are evaluated, and has to integrate the perceptions of the alternatives on those criteria into an overall judgment, or attitude, about the attractiveness of each product alternative.

3.3.1. Evaluative criteria

The criteria used by consumers in the evaluation of alternatives depend, at least to some extent, on the type of food product involved. For example, Termorshuizen et al. (1986) identified the following criteria for milk and similar beverages: ordinary versus luxury, utilitarian versus hedonistic, and refreshing. Callier (1982) uncovered the following three evaluative criteria for meat cuts: nutrition, festivity versus price, and nostalgia. Steenkamp et al. (1986b) identified taste, exclusiveness, vegetable component, fitness for multiple purposes, and fatness as the key dimensions for margarine and butter. Steenkamp et al. (1994) identified extent of processing, taste intensity, taste evaluation, and fatness are key criteria for meat products.

These findings pertain to specific food products. *AGB/Europanel* (1992) investigated the importance of a large set of evaluative criteria for the choice of a product *in general* in seven EU countries. Although not limited to foods, the results are pertinent for food products as well. For each aspect, the respondent was asked to indicate whether or not it was important to him or her in choosing a product alternative.

Table 1: Relative importance of a number of evaluative criteria in the choice of a product (Source: AGB/Europanel, 1992)

	Belgium	Spain	France	Great Britain	Italy	Netherlands	Germany	Total
Product quality	25.5	28.1	20.7	19.1	26.6	23.1	30.8	25.1
Price	19.6	13.0	16.7	15.6	13.1	14.8	18.8	16.5
Brand name/ reputation	12.7	11.3	12.8	21.9	15.9	13.8	10.7	14.4
Freshness	14.2	5.4	10.3	9.4	9.2	13.1	10.3	9.4
Guarantee	6.3	13.7	7.8	12.1	7.3	9.0	8.5	9.4
Habit	5.9	3.5	6.8	2.0	7.3	4.2	1.7	4.1
Safety	4.4	5.1	4.6	2.0	5.3	7.6	4.3	4.1
Choice of several sizes	1.5	3.9	4.3	4.7	2.4	1.7	2.1	3.3
Ease of use	3.4	2.0	3.6	3.1	2.4	3.1	3.4	2.9
Possibility of making selections	1.5	2.7	2.5	2.3	2.9	1.7	2.1	2.5
Appaerance	1.5	2.0	2.8	3.1	1.9	2.1	2.6	2.5
Practical packaging	1.0	2.0	1.8	1.6	2.4	2.4	1.7	2.1
Good state of packaging	1.0	2.3	2.1	2.3	1.4	1.7	1.7	2.1
Variety of brands	1.5	2.0	3.2	0.8	1.9	1.7	1.3	1.6
	100	100	100	100	100	100	100	100

Table 1 presents the results, after normalizing the results per country to 100 to account for differences in response tendencies (Steenkamp, 1992a). The five most important criteria are product quality, price, brand name/reputation, freshness, and guarantee. Product quality itself is a summary construct which subsumes many other aspects (Steenkamp, 1989). The traditional importance of price is also supported by the data. Brand name/reputation also plays an important role. Brand name will be discussed in more detail below in the section on marketing factors. Freshness is a key quality attribute of food *products (Good Housekeeping Institute*, 1984).

The last of the "Big Five" is the presence of some kind of "guarantee." Guarantees provide value to consumers by making it easier to interpret and process information, by reducing purchase risk and increasing consumers' confidence in the purchase decision, and by increasing the use satisfaction because the product obtains an emotional, expressive dimension. Guarantees can take different forms. One type of guarantee is the *brand name*. A brand name identifies the producer of the food product which can in principle be held accountable for bad quality.

Another type of guarantee is *quality labeling*. Steenkamp (1986) found that the presence of a quality label had a significant effect on the perceived quality of smoked sausages. Van Trijp et al. (1996) proposed and tested a conceptual model for the value added to the food product by a quality label. They found that pork with a quality label (i.c., a guarantee concerning integral chain management) received significantly more positive quality perceptions, associations, and overall attitude, lower perceived risk, and higher commitment.

The *geographic origin* of the food product constitutes a third type of guarantee. Most studies found that country of origin does indeed affect product evaluations. In general, consumers prefer food products from their own country to products from other countries (Steenkamp et al., 1986b; Steenkamp, 1993). Related to the country of origin is the concept of region of origin. EU regulations on "designation of origin" (EEC, 1992), the marketing success of products like Parmesan cheese, Parmesan ham, "appellation d'origine controlée" French wines, and the tendency of groups of consumers (e.g., Germans, Austrians) to prefer products from their own region, have stimulated food industry to market products with a region of origin guarantee. The psychological concepts involved in explaining the effects of country of origin and region of origin guarantees are in principle the same. However, adding value to the product with a region of origin guarantee will generally be more difficult because awareness of, and associations with, a particular region will typically be more limited (especially when the product is marketed outside the home country). On the other hand, it can be a useful tool for small and medium sized food companies to compete with big multinationals in the national and international market.

3.3.2. Attributes, consequences and values

According to means-end chain theory, the criteria used in the evaluation process can be categorized at three levels of abstraction: attributes, consequences, and values (Reynolds and Gutman, 1988; Peter and Olson, 1993). Attributes are the physical characteristics of the product. Attributes are either concrete (e.g., vitamin content) or abstract (e.g., fattening) but in both cases, they are directly related to the product itself. Consequences or benefits are the outcomes of product use. They represent what the product is perceived to be doing for the consumer. Consumers tend to think about products in terms of their consequences, not their attributes. A distinction can be made between functional and psychosocial consequences. Functional consequences refer to the direct tangible outcomes of product use (milk is thirst quenching, a Snickers candy bar satisfies your hunger). Psychosocial consequences involve less tangible and less direct personal or social outcomes of product use (drinking milk makes me feel more healthy, or will be criticized by my friends). Values are mental representations of important life goals that consumers are trying to achieve. They are cognitive representations of preferred modes of behavior (instrumental values) or preferred end states of being (terminal values).

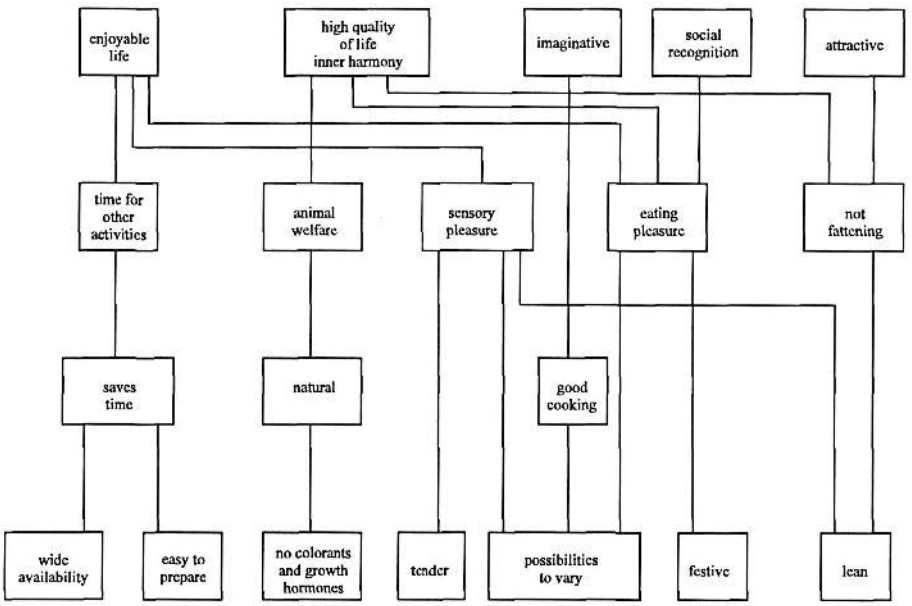

Figure 2: Hierarchical value map for meat.

These three levels of evaluative criteria can be hierarchically ordered. Attributes produce consequences upon consumption, which on their turn contribute to value attainment. From a means-end chain perspective, the meaning of an attribute to

consumers is derived from the consequence(s) to which it is perceived to lead, and ultimately to the value(s) to which it may contribute. For example, a coarse structure of salami (attribute) may lead to perceptions of a better taste (consequence), which may contribute to an enjoyable life (value). A set of interrelated means-end chains, called an hierarchical value map, represents the knowledge structure of an individual or a group of consumers. These hierarchical value maps can be uncovered by "laddering" research, which combines qualitative interviews with quantitative data analysis (Reynolds and Gutman, 1988). Figure 2 provides an example of an hierarchical value map for meat, based on laddering interviews with Dutch consumers.

Traditionally, most research on evaluation of product alternatives has concentrated on product attributes (e.g., the AGB/Europanel study reviewed above). This is understandable as attributes are more actionable than consequences or values. However, a richer picture of consumers' cognitive structure with respect to food products is obtained if all three levels of evaluative criteria, and their interrelations are taken into account. See Audenaert and Steenkamp (1996) for details.

3.3.3. Attitude formation

The attitude toward an alternative is based on the integration of the perceptions of the alternatives on the various evaluative criteria.

Formation of perceptions Perceptions on the evaluative criteria can be formed, based on three types of processes: descriptive, informational, and inferential perception formation (Fishbein and Ajzen, 1975; Steenkamp, 1990). Descriptive perceptions or beliefs result from direct observation (via any of the senses) of the attributes of the product. By trying out a product alternative prior to purchase (e.g., tasting it before purchase), or by drawing on previous experience with the product, a consumer forms descriptive beliefs about certain attributes or consequences. Perceptions can also be formed by accepting information about evaluative criteria provided by some outside source such as friends, advertisements, and consumer magazines. This is called informational perception formation. For example, a consumer can base his or her opinion about the additives content of brand Z on information provided by *Consumer Reports*.

Inferential perceptions are perceptions about a product that are constructed by the consumer, based on descriptive or informational perceptions. For instance, the descriptive belief "this chocolate comes from Switzerland" may lead to the inferential belief "this chocolate will be good tasting." Consumers often engage in inference processes, and they may occur with or without much conscious analytic thinking (e.g., Olson, 1978; Dover, 1982; Pinson, 1986). Cues play an important role in inferential perception formation. They can be defined as informational stimuli that, according to the consumer, say something about the product, and can be ascertained by the consumer through the senses prior to consumption. Cues like

brand name, price, country of origin, store image, as well as physical aspects of the product can affect perceptions of other attributes and consequences, and through means-end chain links, also values (Steenkamp, 1989). For example, brand name affects the taste of beer (Allison and Uhl, 1964) and turkey meat (Makens, 1965); texture the perceived healthiness of salami (Steenkamp, 1989); place of purchase the sensory perception of ham and salami (Steenkamp, 1989); packaging the perceived freshness of bread (Brown, 1958), the perceived taste and crispiness of potato chips (McDaniel and Baker, 1977), and the sensory perception of salami (Steenkamp, 1989); price the taste of margarine (Andrews and Valenzi 1971); color the nutritional value of bread (Peterson, 1977), the sensory perception, healthiness, and keepability of salami (Steenkamp, 1989), and the sensory perception and perceived fatness of ham (Steenkamp, 1989).

Integration of perceptions In the literature, several models have been proposed, specifying the integration of perceptions on evaluative criteria into overall attitude (Bettman, 1979). In marketing, the dominant model is the multiattribute model, in which the attitude is computed as the sum of the perceptions of the alternative on the evaluative criteria, weighted by their importance (Wilkie and Pessemier, 1973). The term "multiattribute" model is somewhat misleading, at least from a means-end chain perspective, because the model does not require that all evaluative criteria are attributes of the product. Criteria of different level of abstractness are used simultaneously[2].

The multiattribute model is a linear additive model. Although in principle, other types of integration rules can be specified (e.g., Bettman, 1979), the linear additive model has been found to be robust, especially in the presence of measurement error, and can approximate other integration rules well (Dawes and Corrigan, 1974; Einhorn et al. 1979).

For a complete insight into attitude formation, the multiattribute model should incorporate both the importance of the evaluative criteria as well as their evaluation (how good or bad is the criterion). Ideally, consumers should provide data on perceptions of product alternatives, importance weights and evaluations. This is quite burdensome, especially for low-involvement products like foods. Moreover, consumers have difficulty separating importances from evaluations, and the validity of the responses may be questionable (Slovic and Lichtenstein, 1971). Therefore, it is preferable to ask consumers to provide perceptions and overall attitudes. Regressing attitude on perceptions yields both criteria importances (magnitude of the regression coefficients) and their evaluation (sign of the coefficients). When the number of product alternatives is too small to allow for individual level estimation, more advanced techniques like fuzzy clusterwise regression (FCR) analysis can be used to estimate the regression coefficients within consumer segments. See Wedel and Steenkamp (1989, 1991) for the development of FCR and its application to food products.

3.4. Choice

Attitude theory posits that, in principle, the product alternative with the most positive attitude will be chosen. However, there are a number of factors that weaken the relation between attitude and choice behavior in the context of foods.

Choice behavior is sometimes also influenced by pressures from the social environment (Fishbein and Ajzen, 1975). However, social influences tend to be low for, what Bearden and Etzel (1982) call "private necessities," such as most food products. Consistent with this notion, Termorshuizen et al. (1986) found that attitude was more important than social influences in explaining (stated) choice behavior for milk, coffee, fruit juice, and related drinks.

The degree of behavioral control is another important external factor affecting the attitude-behavior relation (Ajzen, 1985). It represents a person's belief about the degree to which a behavior can be performed at will. Perceived behavioral control is low when the consumer's favorite brand is frequently out-of-stock, or when it is not carried by the supermarket(s) patronized by the consumer. Shepherd (1990) argued that prediction of non-volitional food-related behaviors requires incorporation of measures of perceived behavioral control in attitude models.

Something which may be peculiar to food products is the inherent seasonality in the production of many food products. However, due to the increased globalization of food markets, many food products that were hitherto only available part of the year, are now available all year round. Not all consumers react positively to this development. Although they may have a positive attitude toward a particular product, they may still be more inclined to buy it in the "right" season. Evidence for this argument is provided in a study involving seven EU countries (*AGB/Europanel*, 1992). Consumers were asked to choose which of the following two statements more closely described their opinion: "I like to find all kinds of products in all seasons in large stores" and "I like to follow the course of the seasons when I buy my products." On average, 52% agreed with the second statement. The percentages agreeing with the second statement in the different countries were: Belgium 51%, Spain 43%, France 45%, Great Britain 52%, Italy 56%, Netherlands 35%, Germany 68%. The high percentage for Germany is especially noteworthy. It is in line with the preference of many Germans for products from the region where they live. The "regional" view of many Germans may be explained by the fact that Germany does not have a tradition of a national food culture, but, on the contrary, shows rather pronounced regional food cultures (Askegaard and Madsen, 1995).

Choice of a particular food product can be limited by habit, despite a positive attitude (see also Table 1). An example is turkey meat, which is predominantly consumed on Christmas, despite the fact that it is a good substitute for other types of meat on other days of the year as well. Empirical support for the importance of habit, over and above attitude and social influences is provided by Shepherd (1990).

He found that adding a measure of habitual behavior to the standard Fishbein and Ajzen (1975) model substantially increased its explanatory power.

Another factor that weakens the relation between attitude and choice is the tendency of consumers to seek variety in their food consumption. Faison (1977, p. 172) succinctly put it as follows: "Your favorite food may be steak but if it were served to you every night for a week, you would quickly tire of it and be screaming for a change no matter how satisfying it was to your need state." Recently, Van Trijp (1995) developed a model in which he distinguishes between the instrumental value, the hedonic value, and the variety value of a product. The former two are incorporated in standard attitude and choice models, but this is not the case for variety seeking value. Three mechanisms are posited to underlie the variety value of a product for a particular consumer: boredom, attribute satiation, and curiosity. Consumers make tradeoffs between the three types of value provided by a product in choosing a particular alternative. If boredom, attribute satiation, and/or curiosity become very large (as in Faison's case), the consumer will switch to another alternative, even though the alternative previously chosen may possess higher instrumental and hedonic value. In an empirical study involving coffee, beer, cigarettes, and hand-rolled tobacco, Van Trijp et al. (1996) found that variety seeking behavior (i.e., behavior motivated by the utility in variation per se, independent of the instrumental or hedonic value of the product) was more likely to occur when involvement was lower, when consumers perceived small differences between the choice alternatives, when they derived greater hedonic sensations from the product category, and when they had a lower strength of preference for the most liked alternative.

3.5. Physiological effects

Eating of food reduces hunger, leads to satiation, and causes people to stop eating. The satiation effect of foods has considerable significance for consumers in the Western world, given the prevalence of dietary concerns. Food properties affecting the degree of satiation include physical form, proportions of macronutrients and fiber, and energy value (Blundell et al., 1988). Solid foods have a greater satiation effect than liquid foods. The satiation effect of protein is larger than the equivalent caloric value of fat or carbohydrate. Alcohol does hardly have a satiation effect, while the effect of fiber is substantial.

High-calorie products reduce hunger more than low-calorie products. People learn to consume more energy-rich foods when hungry than when sated (Booth, 1982). However, humans' appetite control system appears to be highly responsive to an under-supply of energy, but tolerant of over-supply with the consequence that there is relatively little physiological resistance to overeating (Rogers and Blundell, 1990). Although such mechanisms make much sense when food supply is uncertain, they tend to encourage obesity in the Western world where food availability is rarely, if ever, a problem.

The issue of the satiation capacity is particularly relevant to the development of low-calorie products. As energy value is a major source of satiating capacity, the question therefore arises whether the reduction in the caloric content of foods will lead to compensatory behavior that reduces the beneficial effects of consuming low-calorie products. Research indicates that the consumption of low-fat products is probably more effective than the consumption of the equivalent caloric value of low-sugar products. Subjects consuming low-sugar products compensated the decrease in energy intake for about 50% by eating more of other foods while such compensatory behavior did hardly occur for low-fat products (DeGraaf, 1992).

Hunger reduction and satiation may be considered normal physiological consequences of eating food. Food consumption can incidentally cause more extreme physiological reactions such as nausea, vomiting, and gastrointestinal upset. When food consumption is followed by these negative physiological reactions, this may lead to a strong aversion to the food. This learning can occur with delays of hours between ingestion and illness. Food aversions can be "irrational" in that people can acquire aversions to foods even when they "know" that the food was not responsible for the illness. Up to 65% of consumers report at least one strong food aversion, with most aversions apparently being acquired during childhood, a period in which many foods are tried for the first time and when the frequency of sickness with gastrointestinal symptoms may be particularly high (Rogers and Blundell, 1990).

3.6. *Sensory perception*[3]

How people form sensory perceptions based on the properties of the food product has been investigated primarily in psychophysics[4]. The complexity of psychophysical relations has led researchers to study different senses typically in isolation. The simplest situation, called "classical" psychophysics, involves sensory perception of a single physical characteristic:

$$[1]\quad y_i = f_{ij}(x_j)$$

where y_i is perception of the stimulus with respect to sensory attribute i ($i=1,...,m$), x_j denotes the value of the food product on physical characteristic j ($j=1,...,k$), and f_{ij} is the psychophysical function relating y_i and x_j. The two best-known specifications of f_{ij} are Fechner's logarithmic law of perception and Stevens' power law (Stevens, 1975).

Classical psychophysics is of limited validity for studying sensory perceptions of foods because multiple physical characteristics can affect the perceptions on the same sensory attribute, and interactions among physical characteristics are not taken into account (Frank and Archambo, 1986; DeGraaf and Frijters, 1989). Equation [2] extends classical psychophysics by modeling the overall perception toward a multivariate stimulus $(x_1,...,x_k)$:

[2] $y_i = g_i [f_{i1}(x_1), f_{i2}(x_2), \ldots, f_{ik}(x_k)]$

where g_i denotes a multivariate psychophysical transformation function that allows for interactions in the sensory perception process. Equation [2] is used in conjoint-type of studies in which the food products are experimentally manipulated on several characteristics simultaneously. In these studies, g_i is typically specified as either additive or configural, and f_{ij} is free. One example is Huber et al. (1982) who investigated the effects of three physical characteristics of citrus beverage on refreshment perception. Oude Ophuis and Steenkamp (1987) used Equation [2] to estimate the psychophysical relations between sensory preference and color, saccharose, and citric acid. They assumed g_i to be additive and f_{ij} to be linear for color, and curvilinear for saccharose and citric acid.

An even more general psychophysical model allows multiple characteristics to affect the perceptions on the same sensory attribute and any single characteristic to affect the perceptions on several attributes. This requires the researcher to study the total profile of relations between characteristics and perceptions, for which the following model may be used:

[3] $z_q (y_1, y_2, \ldots, y_m) = g_q [f_{q1}(x_1), f_{q2}(x_2), \ldots, f_{qk}(x_k)]$

where z_q and g_q are multivariate transformation functions of sensory attribute perceptions and physical characteristics, respectively, with $q = 1,\ldots r$, and r min (m, k). Thus, more than one set of transformation functions z_q and g_q may be needed to model the psychophysical relations between physical specifications and attribute perceptions. When it is assumed that z_q and g_q are additive and f_{qj} is linear, Equation [3] can be estimated with techniques such as canonical correlation analysis (CCA) or partial least squares regression analysis (PLS). An application is provided by Steenkamp and Van Trijp (1996) who used PLS to quantify the psychophysical relations between physical characteristics and sensory perceptions of meat cuts.

4. Person-related factors

4.1. Biological factors

Age and body weight have been identified as major biological factors affecting food consumption behavior (DeGraaf, 1992). There are certain taste preferences apparently present at birth which can bias food choice. In a seminal study, Steiner (1979) found that newborns like sweet stimuli and reject bitter stimuli. Studies of bottle-fed infants showed that sugar enhances intake and it is added to infant foods in many cultures, presumably for this reason (Rozin et al., 1986). Such innate biases can be highly beneficial to the chances of survival as sweet foods normally contain energy while bitter tastes tend to be ecologically correlated with the presence of toxins (e.g., alkaloids in plants) (Rozin and Vollmecke, 1986).

Similarly, infants can reliably detect, differentiate, and respond to a range of odors only a few hours after birth. Odor preferences have been demonstrated in very young infants, which confers distinct biological advantages. Foods that smell pleasant are probably suitable for ingestion, in that they are not spoiled and do not contain dangerous levels of pathogenic micro-organisms (Van Toller and Kedal-Reed, 1990).

Despite these innate biases, the taste and smell senses are highly adaptable throughout life. Thus, food preference acquisition is probably a life-long process. People learn to appreciate slightly bitter products such as coffee, beer, and grapefruits. Food preferences also change due to aging processes. For example, decline in olfactory sensitivity with age is one of the reasons why many elderly perceive food to be less tasty. See also Schiffman (1979) and Cowart (1981).

There is a positive relation between food consumption and body weight. A partial explanation for this phenomenon can be found in the physiological reaction to foods. In human beings, the smell and sight of foods are sufficiently potent to trigger cephalic phase insulin responses, and the response in obese people is about four times greater than in lean people. The food-induced cephalic phase responses are accompanied by an increase in the desire to eat. Consequently, obese people may have greater appetite than lean people, thus perpetuating their overweight (Blundell et al., 1988).

4.2. Psychological factors

4.2.1. Personality

A large number of personality constructs have been distinguished in the psychological literature. Many of these constructs are quite abstract and are far removed from consumer behavior with respect to foods (e.g., neuroticism, extraversion). One may expect greater conceptual and predictive relevance from personality characteristics which are closer to consumer behavior. We will discuss three constructs that appear especially useful for this purpose, and for which evidence in the context of foods is available: exploratory buying behavior tendencies, quality-consciousness, and consumer ethnocentrism.

Exploratory buying behavior tendencies Among the many motivating influences on buying behavior that consumer researchers have forwarded over the years, the notion of a desire for exploration has been a recurring theme (e.g., Raju, 1980; Steenkamp and Baumgartner, 1992). Behaviors of consumers that have been hypothesized to contain strong exploratory components include risk taking in making product choices, innovativeness in the adoption of new products and retail facilities, variety seeking in purchase behavior, and curiosity-motivated information acquisition (see Steenkamp and Baumgartner, 1992, for a review). All these behaviors have the capacity to lead to exciting and novel purchase experiences, to offer a change of pace and relief from boredom or satiation, and to satisfy one's

desire for knowledge and the urge of curiosity. The unifying element underlying this otherwise disparate list of activities is that they provide consumers with a means of regulating their exposure to sensory and cognitive stimulation, and the various behaviors are exploratory in the sense that consumers engage in them primarily for the pleasure inherent in changing the stimulus field and not out of any extrinsic reason (Berlyne, 1963; Fiske and Maddi, 1961). Exploratory behavior tendencies are especially strong in the area of foods (Hoyer and Ridgway, 1984; Van Trijp et al., 1996).

Recently, Baumgartner and Steenkamp (1996) developed a 20-item scale for the measurement of exploratory buying behavior tendencies (EBBT). EBBT is a measure of a consumer's *tendency* to engage in exploratory buying behavior because it captures the notion of a general disposition to act in a consistent way across different situations. Two dimensions of exploratory buying behavior are distinguished, namely *exploratory acquisition of products* (EAP), which reflects a consumer's tendency to seek sensory stimulation in product purchase through risky and innovative product choices and varied and changing purchase and consumption experiences, and *exploratory information seeking* (EIS), which reflects a tendency to obtain cognitive stimulation through the acquisition of consumption-relevant knowledge out of curiosity.

Baumgartner and Steenkamp (1996) conducted an experiment in which consumers could consume different types of cookies while watching a TV program. It was found that EBBT, and more specifically the EAP subscale, was significantly related to variation in cookie consumption. In a "real world" study, Van Trijp et al. (1996) found that EAP had a significant positive impact on variety seeking behavior across coffee, beer, cigarettes, and hand-rolled tobacco. Moreover, EAP moderated the influence of a number of other variables on variety seeking behavior in a predictable way.

Quality-consciousness Steenkamp (1990) proposed quality-consciousness as a personality factor affecting the quality perception process and the role of perceived quality in consumer behavior. It is defined as a mental predisposition to respond in a consistent way to quality-related aspects which is organized through learning and influences behavior. Steenkamp (1989) developed and validated a 7-item measurement instrument for consumers' quality-consciousness with respect to foods, called QC-F. QC-F has been used successfully in consumer research on the formation of quality perceptions, store choice behavior, market segmentation, reactions to quality labeling, and willingness to pay for better quality, among others. Steenkamp (1992a) tested QF-C in a comparative study involving 10,000 homemakers in nine EU countries. It was found that the cross-national measurement invariance of QC-F was high. The size of the segment of quality-conscious consumers varied from 30.4% in the Netherlands to 53.2% in Belgium. However, the demographic profile of quality-conscious buyers was remarkably similar across countries. They were on the average older, with fewer (younger) children.

Consumer ethnocentrism Shimp and Sharma (1987) introduced the construct of consumer ethnocentrism in the marketing literature, and developed a scale (CETSCALE) to measure the construct. Consumer ethnocentrism is defined as: "the beliefs held by consumers about the appropriateness, indeed morality, of purchasing foreign-made products" (Shimp and Sharma, 1987, p. 280). Extensive research among American consumers revealed that consumers who are more ethnocentric have more negative beliefs, attitudes, and purchase intentions toward foreign-made products, more frequently own an American-made car, and attach more importance to country of manufacture (Shimp and Sharma, 1987).

Tabel 2: Consumer ethnocentrism and purchase behavior with respect to agricultural products form other countries (Source: Steenkamp, 1993)

	Belgium		Great Brittain		Greece		Spain	
Product/ country of origin	**LE**	**HE**	**LE**	**HE**	**LE**	**HE**	**LE**	**HE**
Cheese								
Netherlands	3.0	3.3	14.7	24.1	21.1	36.3	42.8	50.9
France	4.1	6.9	21.7	50.4	-	-	41.4	57.6
Flowers								
Netherlands	29.5	43.0	29.9	40.7	45.8	60.4	73.3	83.2
Pork								
Netherlands	72.3	81.1	-	-	89.9	95.9	97.8	97.9
Bacon								
Netherlands	-	-	44.0	59.9	-	-	-	-
Denmark	-	-	8.3	15.9	-	-	-	-

LE = low-ethnocentric, HE = high-ethnocentric, - = no data available
Explanation: Given is the percentage of consumers that has never eaten the product from a certain country. For instance, 3% from the low-ethnocentric Belgians has never eaten Dutch cheese.

Steenkamp (1993) used the CETSCALE to study consumer ethnocentrism in Greece, Belgium, Great Britain, and Spain. Greece was on average highest in consumer ethnocentrism, and Belgium lowest. Consumer ethnocentrism was found to be related to (non)purchase behavior with respect to agricultural products from other countries. For example, 50.5% of the high ethnocentric British had never bought French cheese, versus only 21.7% of the low ethnocentric British. In Spain the figures were 57.6% and 41.4%, respectively. In Belgium, 43.0% of the high ethnocentric Belgians had never bought Dutch flowers, versus 29.5% of their low ethnocentric countrymen. See Table 2 for details.

4.2.2. Lifestyle

Lifestyle can be defined as patterns in which people live and spend their time and money. In consumer research, lifestyle has become a popular basis for predicting differences in consumption and media behavior between groups of consumer segments. Several comprehensive lifestyle segmentation schemes have been developed. Two of the best-known schemes are VALS and Euro-Sociostyles.

SRI developed the VALS ("VAlues and LifeStyles) segmentation scheme which divides U.S. consumers in nine groups. In VALS, values refer to a wide array of an individual's beliefs, aspirations, prejudices, etc., and hence differs in meaning from the concept of values in means-end chain theory. VALS distinguishes between four general categories of people: the need-driven group, the outer-directed group, the inner-directed group, and the integrated group. These categories were further subdivided to arrive at the nine VALS segments. VALS has been used by hundreds of marketers and advertising agencies, including the U.S. Beef Industry Council. A VALS analysis of beef, lamb, fresh fish, chicken, and turkey breast consumption revealed substantial differences between the nine segments (Thomas and Crocker, 1981). The outer-directed segment of "Achievers" (need-driven "survivors") ate more (less) of all types of meat than any other group. The inner-directed, and stimulation seeking "I-am-me" consumers consume 74% more lamb than the average consumer, but 10% less beef and chicken while need-driven "Sustainers" consumed 11% more fish but less of all other types of meat than the average consumer. Somewhat surprisingly, the inner-directed and liberal "Societally conscious" group also consumed more of all types meat than the average consumer, the most prominent differences being for turkey breast (+54%) and lamb (+60%). The reasons for these observed patterns of behavior are not always very clear, although it seems that income plays a major role in explaining differences in general level of consumption intensity of meat across segments. In 1988, SRI has introduced a new segmentation scheme, called VALS-2. Both segmentation schemes are currently being used by firms (Mowen, 1995).

VALS was developed and validated in the U.S.A. Another segmentation scheme, Euro-Sociostyles, was developed by the French market research agency CCA (*AGB/Europanel*, 1992). The Euro-Sociostyles scheme is truly pan-European as it is based on consumer responses in 15 European countries. Five major lifestyle segments were identified: "fast fun lovers," "controlled elitists," "neotraditionalists," "traditionalists," and "explorers."

Table 3 provides a detailed description of each segment in terms of sociodemographics, attitudes, and behaviors. The traditionalists are on average older and prefer traditional foods. This segment, together with the neotraditionalists, are likely to be most receptive to products from the consumers' own region (or country). On the other hand, the profile of controlled elitists suggests that this segment will be particularly open to global products and brands, provided they have

high quality connotations. Fast fun lovers and explorers are likely to be highest in exploratory buying behavior tendencies. They may be more open to new product introductions than the other segments.

Table 3: Description of five Pan-European lifestyle segments (Source: AGB/ Europanel, 1992)

	fast fun lovers	controlled elitists	neo-traditionalists	tradi-tionalists	explorers
Size/ population	26.9%	15.9%	15%	30.4%	11.8%
Identification	Young or middle-aged; urban; average income	35 - 64 yrs old; good education; high income	Young couples with average income	45 - 64 yrs old; middle class	Young people; high level of studies
Motivations	Have money to spend it	Civil rights; morality	The family; children; comfort	Order; the family; moral values	A better world and more social justice
Attitudes	Individualists and innovators	Conformity	Materialists	Conservatives	Elitists
Priority expenditure	Look and pleasure	Up-market products (financial invest-ments, etc.)	Comfort (the home, etc)	Basic products	Culture and leisure; luxury products
Major interests	Pleasure	Culture	Happiness	The home and the family	Culture
Food	Fast; innovatory; exotic	Gourmet food; high quality food	Modern/ traditional	Traditional; structured; home-made	Quality; variety; facility
Drink	Alcoholic drinks; mineral water; soft drinks	Good wines	Limit oneself	Not to excess	Wide choice of alcoholic drinks
Retail	The most practical (super markets, shopping centres)	Small specialist stores	Modern stores; customer assistance	Supermarkets; local stores	Quality; facility
Marketing	Choice; novelty; attractive packaging	The brand; quality	Confidence in brands	Finding a bargain	Choice; good quality/price relationship
Media	Fun; fashion	Traditional broadcasting	Dreams and utility	TV and entertainment	News; entertainment
Advertising	Cultural stereo-types (American dream, etc.)	Prestige and information	Model family	Simple; per-sonal account	Brand; creativity

VALS and Euro-Sociostyles are general lifestyle segmentation schemes, applicable to all consumers and all products. Such general segmentation schemes have been criticized by Grunert et al. (1993) on several grounds. They lack a theoretical foundation, their ability to predict specific behavior is limited, and the derivation of the basic dimensions that differentiate the segments is unclear. Grunert et al. (1993) developed an instrument that only measures lifestyles related to foods. This instrument purportedly avoids the problems of the general lifestyle schemes. It is rooted in the cognitive approach to human behavior and its main assertion is that lifestyle is how consumers mentally link products to the attainment of life values. They identified five components of food-related lifestyle: higher-order attributes of food products, consequences of using food products, shopping scripts, meal preparation scripts, and usage situations. An exploratory study in Copenhagen, Paris, and London identified 21 factors, covering all five components. The factor structure was remarkably stable across the three cities, and a number of significant differences in mean scores between the cities were observed.

4.3. Sociodemographic influences

In this paper, the term "sociodemographic influences" will be used broadly, including age, education, stage in the life cycle, size of the household, and employment status, among others (note that age also is an important biological factor, as discussed above). The influence of demographic factors is pervasive, affecting various stages of the consumer decision process, but the level of theorizing is not commensurate with their importance.

Stage of the family lifecycle is an important factor in need recognition. The need for baby foods is most clearly recognized by young families, while milk consumption tends to be highest among families with young or teenager children. The growing popularity of smaller package sizes is mainly due to the rapid increase in the number of singles (although the societal trend towards individualism should not be disregarded), as well as to a general decline in household size in most Western countries. The increasing demand for convenience foods is also stimulated by the increase of the number of single-person households, because of time pressure and because the inclination to prepare all the food by oneself may be less prevalent if there is nobody to share the meal with.

Higher educated people are able to process more information about foods (although they may lack the motivation to do so). They also tend to give more weight to so-called "neutral" sources of information (e.g., consumer magazines, nutritional information), as opposed to commercial (e.g., advertising) sources (Steenkamp et al., 1986a). In product evaluations, higher educated people tend to give more weight to "ethical" criteria such as animal welfare or environmental harmfulness of the product (Steenkamp and Oude Ophuis, 1987), and less importance to brand name (Steenkamp et al., 1986a) and country of origin (Steenkamp et al., 1986b). A similar

pattern of findings was also found for younger consumers (Steenkamp et al., 1986a, 1986b).

One the most important demographic influences is the employment status of the wife. It affects all aspects of the decision process through its effects on available time for domestic tasks and family income. The percentage of women that is employed outside the home has increased rapidly after World War II. Consequently, less time is available for food buying and preparation, and there is a greater need for time-saving food products. Figure 3 illustrates this point. It reveals a positive relation between the percentage of women in the workforce in a particular country and the consumption of frozen foods.

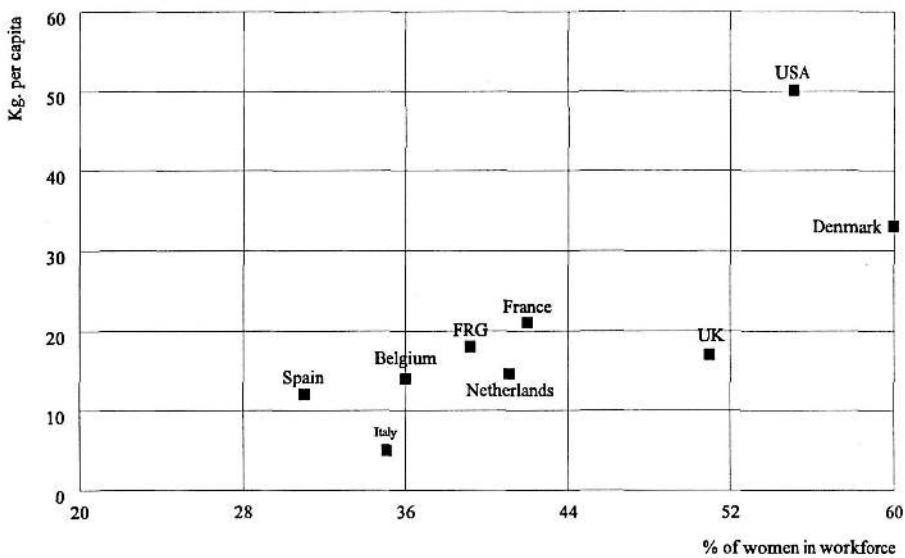

Figure 3: Consumption of frozen foods and percentage of women in the workforce in various countries

5. Environmental factors

5.1. Economic factors

Economic analyses are less oriented towards explaining the behavior of individual food consumers than to groups of consumers. Economists have abstracted from most details of human behavior to concentrate on what in economic terms are the most important factors affecting food consumption behavior (Tangermann, 1986). The two foremost economic factors influencing demand for food are incomes and prices (Deaton and Muellbauer, 1980)[5].

5.1.1. Income

In the 19th century, Engel formulated a "law," stating that "the poorer a family is, the greater the proportion of total expenditure which it must use to procure food. The wealthier a people, the smaller the share of expenditure on food in total expenditure" (Burk, 1962). In other words, the income elasticity of demand for food products is smaller than one. The validity of Engel's law has been supported in many countries and at different times. We tested Engel's law on a cross-section of country aggregates instead of on different income groups within a single country. Share of food in total expenditure was regressed on the index of real GDP/capita (i.e., adjusted for differences in purchasing power). Data for 85 countries were obtained from *The Economist Book of Vital World Statistics* (1990). The scatter plot of the data and the regression equation are shown in Figure 4. Real GDP/capita accounted for 62.7% of the variance in food share of expenditure ($F(1,83) = 139.4$, $p < .001$). This provides strong support for Engel's law at the level of country aggregates. The regression coefficient indicates that one point increase in the real GDP/capita index leads to a reduction in food share of expenditure of .394%.

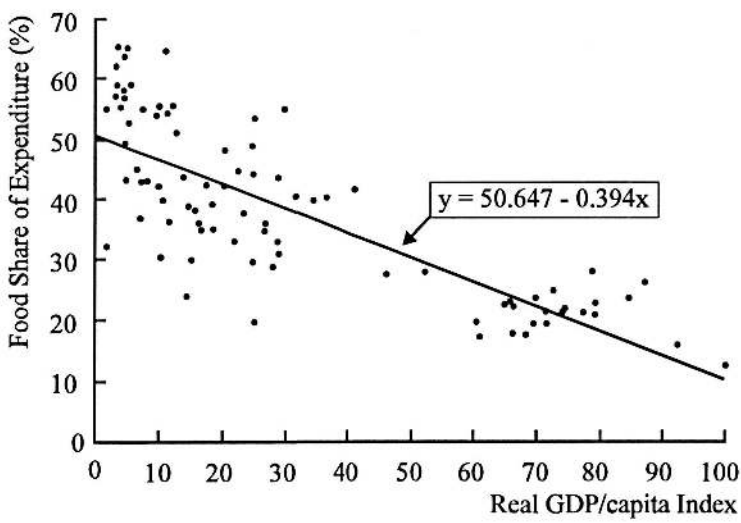

Figure 4: Relation between real GDP/capita (US = 100) and share of food in total expenditure for 85 countries

Engel's law deals with aggregate food expenditure. His law cannot be directly applied to quantities consumed of *individual* foods as the income elasticity varies considerably between different foods. With rising incomes, consumers tend to switch from more basic products to more luxurious (i.e., more expensive) food products. This means that higher valued commodities have a higher income elasticity than more basic foodstuffs. However, even the income elasticity of these foods is typically below unity (Ritson, 1977), which is consistent with Engel's law at the aggregate level. What is considered a higher valued commodity differs from

country to country, but cross-national research in the EU, U.S.A., Japan, Australia, and New Zealand indicates that commodities like meat, cheese, fresh dairy products, fruit, and vegetables would in many cases fall into this category (Tangermann, 1986). Cereals for human consumption and potatoes exhibit properties of an inferior good, while butter exhibits no correlation with income (EU, Japan) or a negative correlation (New Zealand, Australia, U.S.A.). The case of butter illustrates some limitations of economic analyses. Butter is a luxurious product, but with rising incomes, health concerns also increase, and for this reason, butter is avoided.

Income per capita plays an important role in predicting when demand for particular types of foodstuffs will "take off" in a country. More expensive types of food require a certain level of income per capita to create a minimal level of demand in a country. Moreover, one needs modern types of retail outlets (e.g., supermarkets) to sell more sophisticated food products (such as frozen products), but these outlets require a relatively high income level. Figure 5 provides "trigger" levels of GDP/capita required for the market success different food products, as used by Unilever to adjust its product portfolio to the income level of a particular country (*The Economist*, 1993). The figure indicates that in the Western world, consumer demand is high for health and nutrition, variety, branded products, pre-prepared products, and fresh foods, while the income elasticity for basic frozen foods, and especially basic packaged foods and loose unbranded cereals is low or even negative. In countries like Mexico and Malaysia, with a GDP/capita approaching $5000, basic packaged foods have a relatively high income elasticity, and offer tremendous market opportunities.

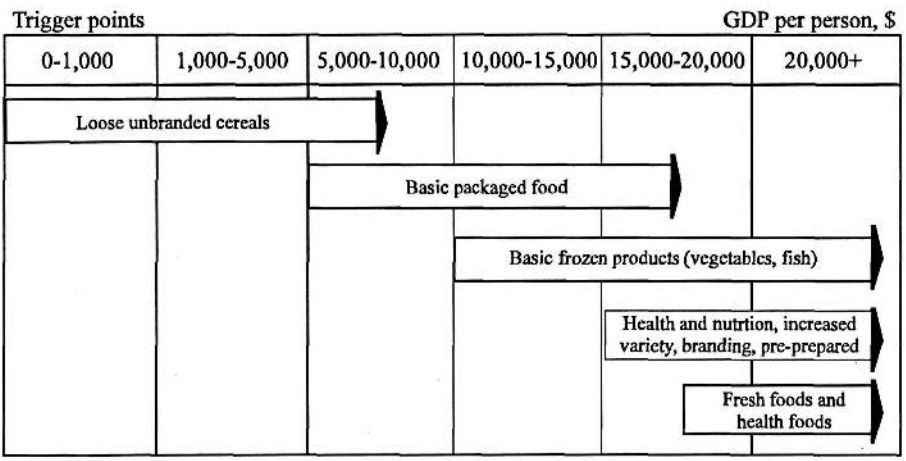

Figure 5: Trigger levels of GDP per capita for different types of foods

Nestlé uses income per capita as a criterion to introduce products of its portfolio in emerging markets. In step 1 (lowest income/capita), milk and infant formula are introduced, in step 2 coffee and milk drinks, in step 3 culinary products (Maggi), in step 4 confectionery, in step 5 ice cream, in step 6 breakfast cereals, and in step 7 pet food (Heijbroek et al., 1995).

5.1.2. Price

The price elasticity of demand for food commodities is usually negative, implying that consumption decreases with price increases (after adjustment for changes in the general price level). However, the quantity reaction is generally less than proportional to the price change, implying a price elasticity between 0 and -1. Consumers react more strongly to changes in the prices of individual food items such as pork, chicken, or beef, than to price changes for the broader category, such as meat. This is due to the fact that in the former situation, it is relatively easy to switch to another item within the same category. Cross-price elasticity may be positive or negative, dependent on whether the two goods are substitutes or complements. In general, food consumption has been found to be rather price inelastic, which is plausible considering that food is both a necessity as well as a saturation good (Tangermann, 1986).

Three exceptions to the general rule that price elasticities are negative are the "Giffen" case, the "Veblen" effect, and the "perceived quality" effect. The Giffen case, which was first observed in the 19th century by Sir Robert Giffen for potatoes in Ireland and bread in England, occurs when a certain basic food item which accounts for a high share of total expenditure, increases in price. This reduces the purchasing power of (poor) families, so that they can no longer afford to consume "luxury" items (i.e., everything else) and have to resort to even higher consumption of the basic food item whose price has increased. The Giffen case has lost much of its relevance for developed countries but may still apply to some income groups in developing countries. The Veblen effect is caused by the phenomenon of conspicuous consumption. For example, Chivas Regal whisky or Beluga caviar may lose much of their appeal when the price would be substantially lowered. The third case of non-negative price elasticities concerns the "perceived quality" effect. Empirical evidence (e.g., Rao and Monroe; 1989, Steenkamp, 1989) suggests that when prices are very low, demand falls because the quality of the product becomes suspect. The latter two phenomena are more likely to occur for individual brands than for generic food categories.

5.2. Culture

What we eat, how it is prepared, the rules and meanings which permeate every aspect of food consumption practices, etc., are all cultural matters, irrespective of their biological, psychological, or economic dimensions which they clearly possess (Fischler, 1988). Rozin et al. (1986) even argued that if one were interested in determining as much as possible about an adult's food preferences, and one could

only ask him or her one question, the question would be: what is your culture or ethnic group? In the process of enculturation, exposure to particular foods is controlled and food values and attitudes are conveyed.

From a cultural perspective, consumers buy products to obtain function, form, and meaning (Engel et al., 1995). *Function* refers to the utilitarian aspect, or functional consequences of the product. Food should provide nutrition, reduce hunger, quench thirst, etc.
Food products should also meet expectations about *form*. Nutritional requirements are met in many different ways, but some forms are preferred by consumers. Some foods are expected to be consumed hot, or cold, crisp, tender, or microwavable (Engel et al., 1995). One interesting aspect of form is what products are in principle acceptable to fulfill food-related needs. Or, in other words, which products are considered food in the first place? By early adulthood, every individual in every culture has adopted a culturally based set of beliefs and attitudes about objects in the world, with respect to their edibility. Which products are considered food or non-food is largely culture-dependent (see Table 4 for some examples).

Table 4: Examples of different classifications of animal species (food versus non-food) (Source: Adapted from Fischler, 1988)

	Location	
Species	Food	Non-food
Insects	Latin America, Asia, Africa, etc.	Western Europe, North America (?)[1], etc.
Dog	Korea, China, Pacific Isles, etc.	Europe, North America, etc.
Horse	France, Belgium, etc.	Britain, North America, etc.
Rabbit	France, Italy, etc.	North America, etc.
Snail	France, Italy, etc.	Britain, North America, etc.
Frog	France, Asia, etc.	Europe, North America
Termites	Malaysia	Europe, etc.

Anthropologists have tried to explain classifications of food and non-food by considering the degree of closeness of the animal to ourselves and to our homes (Murcott, 1986). Animals which are either too close (e.g., pets) or too remote (e.g., lions) will not be considered food. Horses are more or less regarded as a sort of pet in the U.S. and Britain and are therefore non-food, while they are considered edible in France and Belgium because they are presumably more remote. The same might be applicable to dogs in Western Europe and the U.S. versus Korea and China. However, this explanation does not appear to be comprehensive. Are snails or frogs closer (or more remote) in Britain or the U.S. than in France? The concept of "too remote" seems particularly ambiguous. For example, ostrich steak is a delicacy in the Netherlands although this animal is very remote from the Dutch culture.

Products also provide symbols of *meaning* in a society. Spinach is associated with strength, possibly enticing children to eat it. Food recipes handed down through generations symbolize family traditions, national or ethnic identity. Products are sometimes used in ritual behavior, such as a wedding cake, champagne during New Year's Eve, or the turkey on Christmas. Sometimes foods are imbued with special religious meaning, and consuming them may be required (e.g., bread during Mass) or forbidden (e.g., pork for Jews and Muslims, beef for Hindus).

Different explanations have been forwarded to account for these cultural taboos, including functionalist and structuralist views (Fischler, 1988). The functionalist view maintains that any cultural trait serves a specific function, and that this function can be explained only by extra-cultural (biological, physical, economic, etc.) factors. For example, the Jewish and Muslim taboo on pork is explained by the contention that in the Middle East, undercooked pork was a source of trichinosis. The structuralist view holds that cultural traits can and must be explained by other cultural traits. A structuralist explanation of the pork taboo is that pork did not fit in the food taxonomies of the Israelites and Arabs, and was therefore rejected as impure. These peoples were pastoralists, herding cattle, sheep, goats, and camels. Cloven-hoofed and cud-chewing, these animals provide a model of proper kinds of food which does not include pork because pigs do not conform to these criteria (Murcott, 1986).

Culture clearly influences food consumption behavior, but food products also are an important vehicle to transmit cultural values and meanings to consumers. McCracken (1986) described how cultural values of a society may be transmitted to consumers through consumer goods. He argued that people use goods to link cultural meanings to themselves. For example, buying ecologically produced foods is a way to represent ourselves to others as environmentally conscious, and buying products from Third World cooperatives serves as medium for the expression of our solidarity with less wealthy humans.

5.2.1. European food cultures

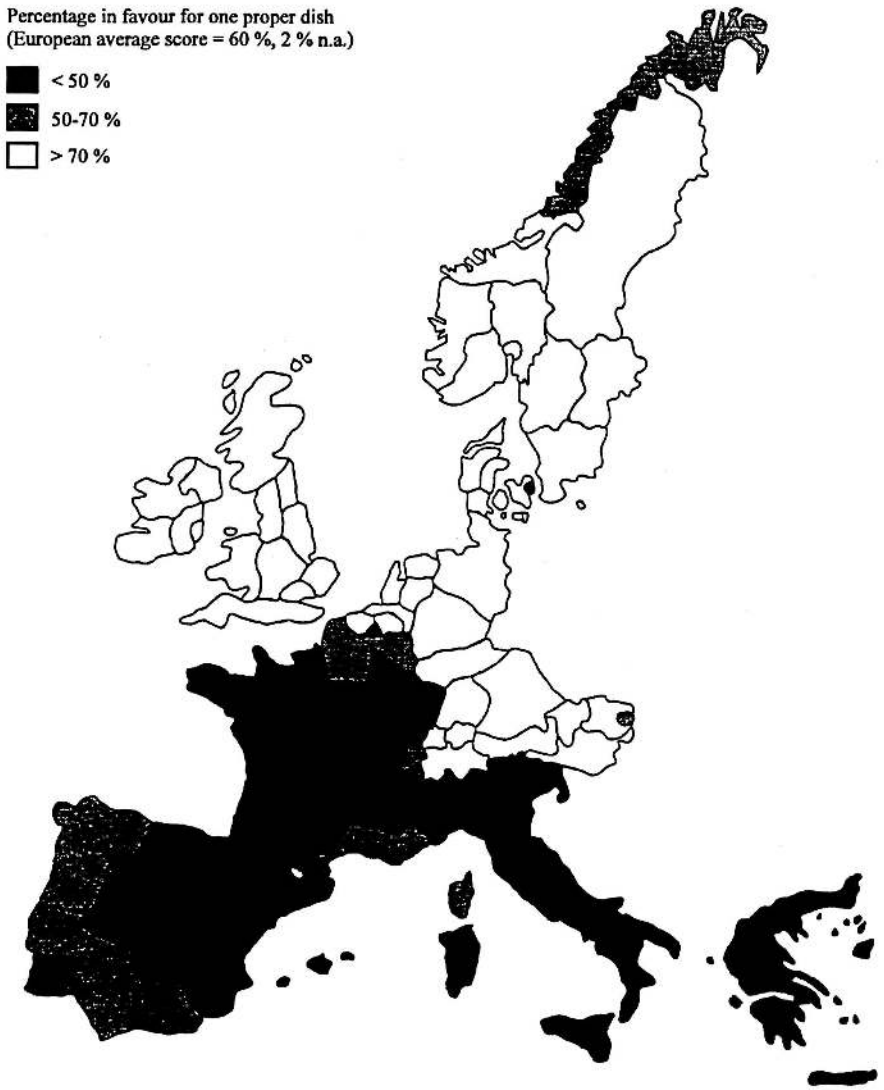

Figure 6: Preferences in Europe for one proper dish with vegetables and meat versus many small dishes

Food cultures are often operationalized at the country-level, in that countries are compared on their food culture. However, there may be important within-country socioeconomic and geographic differences in food culture. For example, the French sociologist Bourdieu argues that differences in food consumption practices within a society are largely based on social class (Bourdieu, 1985). He maintains that food

consumption is a vehicle for social stratification, an embodiment of class inequality, and of the stratification of knowledge, aesthetic sensibility, and values. Tastes in food, and the distinctions which they signal, are part of a cultural system which enacts the relationships between social classes, and which expresses the values of their members.

Food culture can also differ between regions. In fact, it is possible that some regions within country A are more similar to regions in country B than to other regions in country A. Recently, Askegaard and Madsen (1995) have conducted a large scale investigation into various aspects of the food culture in 15 European countries. Due to space constraints, we will limit the discussion to one particularly interesting finding, viz., meal composition. Respondents were asked whether they preferred one "proper" dish with meat and accompanying vegetables or a composite meal consisting of many small dishes. Each country was divided into several regions (for a total of 79 regions), and responses within each region were aggregated. The results are given in Figure 6. It shows that the responses are transnational. On average, 60% of the Europeans prefer one "proper" dish, while 38% prefers many small dishes. However, there are substantial differences between North and South Europe. The majority of the Southern Europeans prefer many small dishes. With a few exceptions, more than 70% of the Northern Europeans prefers one "proper" dish. The line distinguishing between these two Euro-regions roughly parallels the border of the Roman Empire[6]. Approximately the same cultural border can be identified for beer versus wine consumption.

5.3. *Marketing factors*

Food consumption in kilograms is necessarily subject to saturation. This is much less the case for the extent to which value is added to the food product through "marketing activities" (the added value of the industry, trade, retailing, and food service). As indicated by Figure 5, demand for variety, pre-prepared products, branding, etc. increases with rising incomes. The income elasticity of demand for raw product at the farm level is much lower than the income elasticity for "marketing activities" (Tangermann, 1986). Illustrative are findings reported by Tangermann (1986) for Denmark. He estimated the income elasticities of demand for raw products at the farm level and for marketing activities. The income elasticity of demand for different types of cereals at the farm level varied between -.06 and .03, while the income elasticity for marketing activities was .53. Income elasticities for raw dairy products and eggs varied between -.12 and .37, while the income elasticity for marketing activities was .98.

The difference in income elasticity between raw products at the farm level and marketing activities implies that with rising incomes, the share of farm-level value in total food expenditure decreases, while the share of marketing activities increases. In Germany, for example, the share of farm-level value in food value at the retail level decreased in 1964-1981 for vegetables from 32.5% to 23.0% and for animal

products from 58.0% to 50.7% (Tangermann, 1986). In the USA, farm-level value in the 1980s increased 25%, while the value of marketing activities doubled. Aggregated across all food expenditure, the share of marketing activities in total food value increased from 1950 to 1988 from 59% to 75% (Heijbroek et al., 1995). Thus, the law of Engel actually understates the effects for farmers while providing too pessimistic a picture with respect to food industry. This partially explains why many farmers are in trouble while food industry is still growing and in general profitable (but see also *The Economist*, 1993, for a cautionary note).

5.3.1. Branding

One important way to add value to the food product is branding. It has been observed that: "It will be more important to own markets than to own factories. The only way to own markets is to own market-dominant brands" (Aaker, 1991, p. ix). Brand value is created by improving the quality image of the brand, and by enhancing brand name awareness, brand loyalty, and positive brand associations (Aaker, 1991).

One decision a firm faces is whether it will develop a separate brand for each country, or use one brand for a group of countries (e.g., Eurobrand) or for the whole world (global brand). A national brand can be tailored to the local market, and its name can be selected without constraints of a Euro/global brand. Consumer ethnocentrism sentiments will be less, the costs of physical distribution are lower, and it can use local ingredients. On the other hand, a Euro/global brand provides scale economies, allows exploitation of media overlap and of consumers who travel (tourism, businesspeople), and rapid roll-out of a successful innovation. Market communication can also be more sophisticated because resources and creative ideas are pooled across countries. A Euro/global brand allows the brand to build associations 1) with a European or global presence, which can add to its prestige and may generate consumer confidence, or 2) with the "Home Country," i.e., the country from which the brand originates (whether this is positive depends on the image of home country for that food product; see also below). Association with the Home Country is especially attractive if that country has a special credibility for the product category in question, such as England in case of marmalade and cookies, France for wines, Switzerland for chocolate, and Belgium and Germany for beer. Given the huge, and spiralling costs of launching new brands, food companies are increasingly turning towards the development of Euro/global brands.

5.3.2. Country of origin

The importance of country of origin in the consumer decision process was noted earlier in this paper. Marketers should decide whether to emphasize or de-emphasize the country of origin in their marketing strategies. This decision should be influenced by the match between the country of origin and the product category in question.

Roth and Romeo (1992) developed a framework for matches or mismatches between a product category and a particular country of origin. An *unfavorable* match exists when a country is perceived to be weak in an area that is an important feature for the product category. For example, Mexico is perceived to be weak in engineering, while engineering excellence is important for cars. Consequently, there is a weak fit between Mexico and cars, resulting in low consumer evaluations of Mexican cars (Roth and Romeo, 1992). Conversely, a *favorable* match exists when the country is perceived to be strong in an area that is also an important feature for the product category. Germany is perceived to be strong in engineering, and hence, there is a favorable match between Germany as country of origin and cars, indicating that German cars receive, ceteris paribus, highly positive consumer evaluations. Similarly, the hedonic features of the image of France suggest that the contribution of France as country of origin will be more positive for perfume than for cars. Roth and Romeo's framework can also be applied to foods. As an illustration, we will adapt and apply their approach to analyze the strategic options for agricultural products from the Netherlands.

It seems that in the past, there was a favorable match between "Holland" and agricultural products. Actually, many Dutch companies emphasized their country of origin, and used the Holland logo as a substitute for a brand name. However, there are indications that at least in some countries, the match has become less favorable. Roth and Romeo's approach suggests that the strategic implications for Dutch agriculture are different for matches and mismatches (see Figure 7).

Strategic implications	Match between the Netherlands and agricultural products	
	Favorable	*Unfavorable*
	* Brand names reflects the Netherlands	* Emphasize benefits other than "Holland"
	* Packaging reflects Dutch origin	* Non-Dutch branding
	* Promote the product's Dutch origin	* Communication campaign to enhance "Holland" image
		* Joint venture with favorable match partner

Figure 7: Strategic implications of product-country matches and mismatches

When in a particular foreign country, a favorable match exists between the Netherlands and agricultural products, consumer evaluations can be enhanced by promoting "Holland" as country of origin, e.g., by using a Dutch sounding brand name that reflects the product's country of origin or by placing "Holland" and its logo/flag on the packaging or the product itself. This strategy has been used in the past with great success.

If an unfavorable match exists, country of origin information may be even detrimental to product evaluations. In this case, advertising should emphasize important product attributes rather than "Holland." Further, non-Dutch sounding brand names should be used. A recent study by Leclerc et al. (1994) documents the effectiveness of using foreign sounding brand names to improve product evaluations. It was found that a foreign sounding brand name even exerted a stronger effect on consumer judgments (including taste perceptions) than country of origin information.

Another, long-term strategy is to initiate a campaign to alter the image of the Netherlands as producer of agricultural products. The focus of that campaign should be on improving consumers' image along dimensions that are viewed negatively. This should result in more positive affective reactions to "Holland," and to more favorable perceptions of Dutch agricultural products on selected attributes such as taste or mode of production, which in its turn increases attitudes toward Dutch agricultural products. Finally, Dutch agricultural companies could consider a joint venture with a partner from a favorable match country.

5.3.3. Distribution

In many Western countries, a rapid increase in the concentration of the food retail sector can be observed. Figure 8 provides the market share of the three largest supermarket chains in several countries. The concentration is highest in the smaller markets. In the individual states of the USA, concentration is comparable to that of individual EU countries (Heijbroek et al., 1995). Increasingly, small independent grocery stores are replaced by supermarket chains, and the end of this development is not yet in sight. This has profound effects on consumer behavior. Supermarkets facilitate impulse buying. Their assortment is much wider, which stimulates variety seeking and innovative behavior. They have the floor space to carry in-store promotions and have equipment to store products that have special technical requirements (such as frozen or cool-fresh products). Because of faster turnaround time of products, quality is better guaranteed. Larger stores also facilitate one-stop shopping. A study conducted by *AGB/Europanel* (1992) indicates that consumers recognize the advantages offered by large stores. As evidenced by Table 5, European consumers overwhelmingly are positively inclined towards supermarkets.

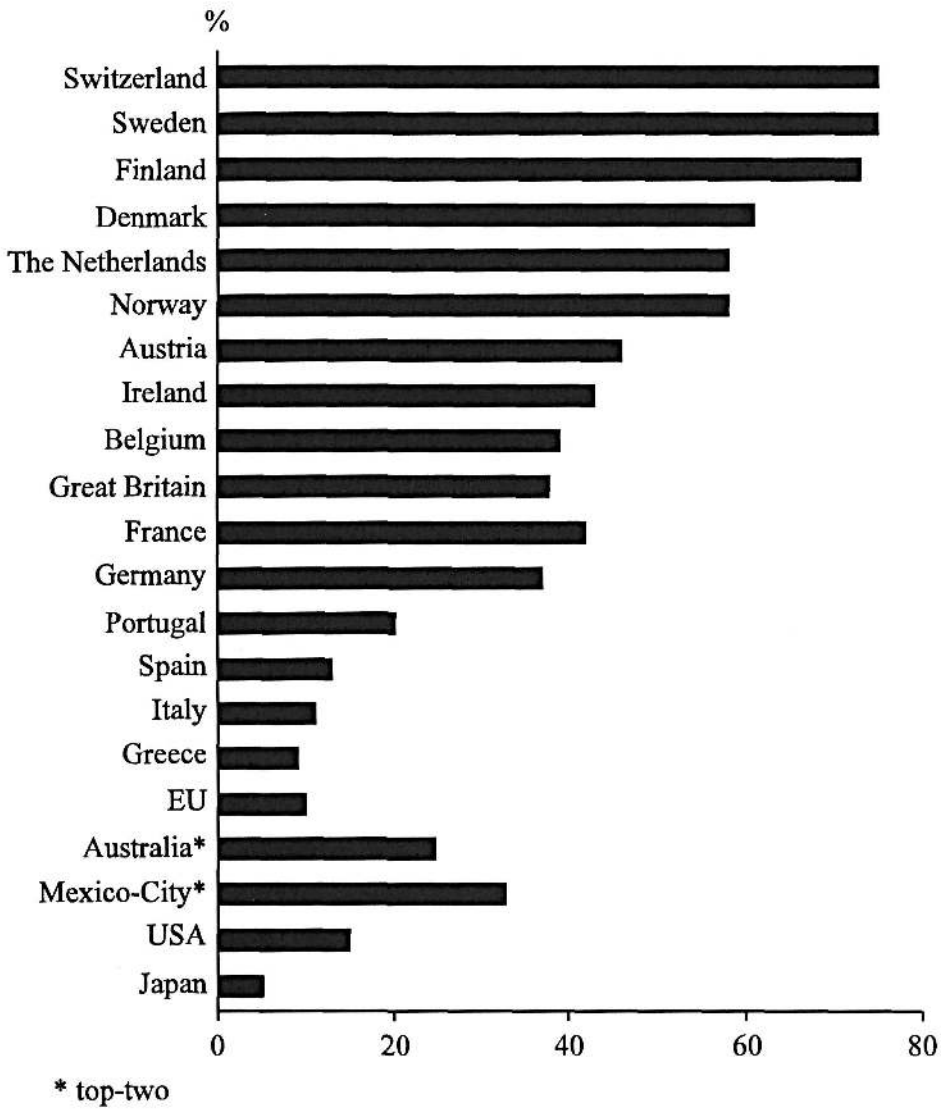

Figure 8: Concentration in food retailing; market shares of the three largest chains

The increased concentration in food retailing allows these supermarket chains to develop their own brands. In Great Britain and Switzerland, the market share of store brands already exceeds 30%, while store brands also have a substantial market share in many other countries (see Figure 9). Many consumers feel that store brands have about the same quality as manufacturers' brands and inspire as much confidence, while they are cheaper (see Table 6)[7].

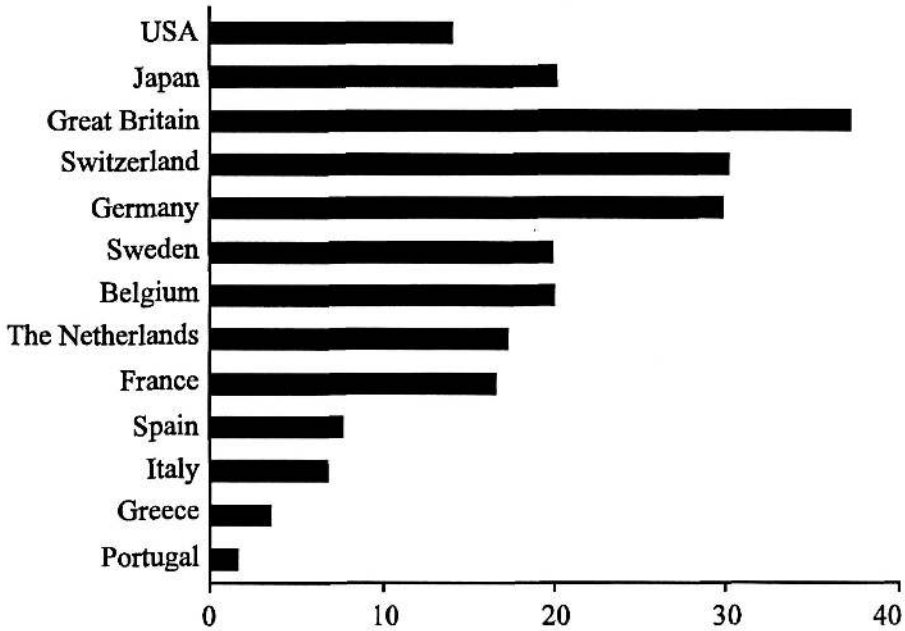

Figure 9: Market share of store brands

For at least three reasons, the market share of store brands is expected to increase in the future (*AGB/Europanel*, 1992). First, some retail chains which to date were reserving their store brands for mass consumption basic products (oils, jams, pastry products, etc.) will extend their ranges to more sophisticated products (sauces, breakfast cereals, etc.). Second, better storage logistical control by retail distributors will enable them to develop their own-label products in markets where to date they have had little significance: dairy, deli foods, frozen products, etc. Third, it is consistent with the desires of consumers. In a study involving seven EU countries, on average 38% of the consumers indicated that their ideal store of tomorrow would carry more store brands (*AGB/Europanel*, 1992). The highest scores were obtained in Great Britain (48%), Germany (47%), and the Netherlands (41%). Italy rated lowest with 20%. Thus, store brands represent a major threat to the market position of manufacturers' brands.

However, a cautionary note is warranted. Despite the positive attitude of many consumers toward store brands, their popularity has been found to vary with the income situation. When disposable income declines, store brands typically gain market share. On the other hand, their popularity generally decreases in more favorable economic conditions (Hoch, 1996; Quelch and Harding, 1996).

Table 5: Image of supermarkets versus small stores (%)[1] (Source: AGB/ Europanel, 1992)

	Belgium	Spain	France	Great Britain	Italy	Nether-lands	German y	Total
More and more I frequent very large hypermarkets where you find everything in the same place.	68	68	64	67	76	78	68	68
I prefer to frequent different, specialised stores.	32	32	36	33	24	22	32	32
I prefer to do my shopping in a self-service store where you don't have a vendor annoying you.	84	67	83	79	77	86	78	76
I prefer to do my shopping in small shops where there's someone to assist you and give you advice.	16	33	17	21	23	14	22	24
I prefer large stores where there is a wide selection of brands and you can compare prices.	87	81	84	83	83	92	73	79
I prefer stores where you don't get lost in the store and where you can trust the choices made by the store managers.	13	19	16	17	17	8	27	21

[1]Respondents were asked to choose from each pair of opposing statements the one closest to their opinion

Food companies can try to retain their market position by strengthening their brands. This can be achieved in at least three ways (Hoch, 1996). First, they can increase brand value by 1) improving quality and/or 2) reducing their prices through cost cutting. Unilever, Grand Metropolitan, and Philip Morris are examples of companies following this strategy. Quality improvement can take many different forms, and need not only be limited to the physical product per se, but may also involve

packaging. For example, environmentally friendly packaging is becoming an increasingly important marketing tool.

Table 6: Image of store brands compared to major manufacturer brands (%)[1] (Source: AGB/Eurpanel, 1992)

	Germany	Spain	France	Italy	Great Britain	Total
More expensive	3	2	2	3	1	3
As expensive	12	16	29	29	13	19
Less expensive	78	85	72	72	68	86
Higher quality	2	6	3	7	4	5
Same quality	90	73	78	71	77	78
Lower quality	8	21	19	22	18	17
Inspire:						
More confidence	3	7	4	10	5	6
As much confidence	84	71	73	66	74	74
Less confidence	12	22	23	24	21	21
Awareness of store brands	65	85	75	85	81	78

[1]Basis is the percentage of individuals who are aware of store brands in the stores they visit

Long-term price reductions (as opposed to short-term sales promotions; see below) to narrow the price gap with store brands, which has sometimes grown too large (Quelch and Harding, 1996), can also be highly effective. Studies show that cross-price elasticities are asymmetric. Price changes by manufacturers' brands affect store brands more than corresponding price changes by store brands affect manufacturers' brands sales. Consumers appear to be more willing to trade up in quality rather than down (Hoch, 1996). It is important to replicate this U.S. study in countries like Germany or Great Britain where store brands enjoy a stronger market presence.

Second, genuine innovations, and not just mutations of existing products and minor line extensions will help keeping store brands at bay. The market share of store brands is lower for food categories which show a higher number of new-product

launches (see Figure 10). Few store brands can afford to pay for the research and development needed to develop new products.

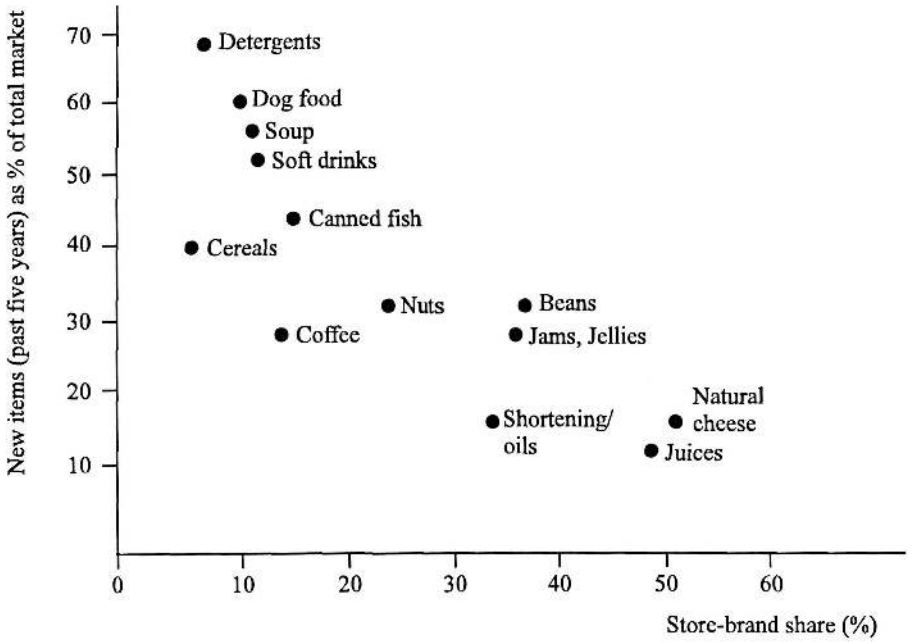

Figure 10: Relation between innovation and the market share of store brands

Third, food companies should shift resources from sales and trade promotions to advertising. While promotions can boost sales in the short run, they hurt the premium image of the brand and lower the price consumers are willing to pay. Advertising can be used to build brand associations and a perceived quality image. In this way, the brand provides other purchase reasons than price. Evidence from Great Britain (see Figure 11) suggests that in food categories characterized by heavy advertising spending, store brands are less likely to capture a high market share (an exception being jam). This is consistent with the brand equity literature (Aaker, 1991).

The retail environment does not only affect consumer behavior with respect to foods, but the behavior of consumers also influences the retail environment. Consumers tend to buy at stores that have an attractive image while avoiding stores with a less positive image. Some supermarket chains have worked hard to improve their image in areas where they were traditionally weak, namely fresh agricultural products such as vegetables, meat, and dairy products. Much effort has been devoted to improving consumers' quality perceptions of the fresh products offered in these

stores, because product quality is a key component of store image, and supermarkets had a relatively unfavorable image on this aspect (Steenkamp and Wedel, 1991). This has resulted in a substantial improvement in their store image, which contributed to the significant shift in market share from specialty stores (greengrocers, butcher stores, etc.) to supermarket chains.

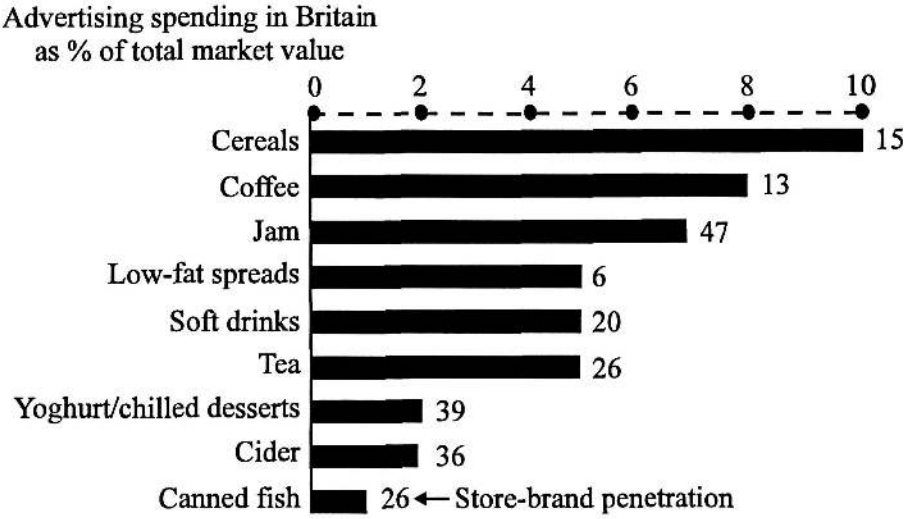

Figure 11: Advertising spending and market share of store brands

6. International trends in food consumer behavior

Given similar demographic developments, increase in tourism, emergence of global marketing strategies, rapid dissemination of information through mass media, and government attempts to influence food consumption, it may be expected that there are some general trends in food consumer behavior across countries. Below, we will identify eight major trends in international food consumer behavior. These trends are partially interrelated. Admittedly, identifying trends is a rather speculative undertaking, and they are subject to revision when strong counter evidence emerges. Moreover, no claim is made that the set of trends described below is exhaustive.

One trend is that a number of consumers gradually move away from the trade-off of quality versus price towards that of *shopping versus enjoyment* (*AGB/Europanel*, 1992). For many consumer, thrift is no longer a moral value but a means to enable enjoyment. Consumers seek to economize as much as possible on products that are less important to them, in order to allow themselves to enjoy pleasures. This polarization effect is reflected on the one hand in the success of store brands, and on the other hand in the increasing demand for gourmet, exotic, and ethnic food.

Another trend is an increased *fragmentation of the market*. Consumers want to distinguish themselves from others. Products are an important means for achieving this. Simple, clear-cut (sociodemographic) segmentation schemes will lose predictive power. When Europeans are asked for their ideal store, by far the most frequently given answer is one offering a wide range of products (at low prices) (*AGB/Europanel*, 1992). Along with growing fragmentation, we can expect an increase in consumers' variety seeking behavior. Niche products with high added value and lifestyle products should help consumers to differentiate themselves from others.

A third trend is growing *time pressure*, especially among two-earner families. This will stimulate demand for convenience. Sometimes, cooking is a pleasure (visit of friends in the weekend, etc.), but otherwise, it is increasingly a chore which should be finished as quickly as possible.

Related to the third trend is a fourth trend, viz,. the increase in *female employment* (see also above). Consequently, less time is available for food buying and preparation, and there is a greater need for time-saving food products. Figure 3 illustrated this point. The demand for time-saving (frozen and ready-to-eat) products offers the potential to add value to the raw agricultural product through processing. Development of innovative time-saving products represents one of the growth markets for food industry. Another consequence of female participation in the work force is that family income increases. This should lead to a greater demand for high quality products (Steenkamp, 1989). Families with working wives also spend significantly more on food away from home (which is another way to save time).

A fifth trend is growing *health concerns*. This is caused by lack of physical exercise, a life full of stress, and time pressure. But an even more important factor is the rapid aging of the population in the Western world. Older people experience more health problems than young people, and are hence particularly interested in products that can contribute to or restore their health. The consumption of healthy products, such as low-calorie, light and "natural" products, which (are perceived to) contribute to one's health and help to avoid sickness is likely to grow.

A sixth trend is growing *environmental and ethical concerns*. Food products that are harmful for the environment or are produced in an environmentally unfriendly way will encounter growing consumer resistance. Moreover, ethical issues related to production processes, such as animal welfare, will become more important. "Process-oriented" quality will become ever more important in the future. In the terminology of Grunert et al. (1996), process-oriented quality will become ever more important in the future.

A seventh trend is the shift away from home consumption *to food-away-from-home consumption*. This means that the consumer as well as the supermarket have less

influence on the products/ingredients consumed, while organisations in the food-away-from-home market become more important.

An eighth, and somewhat different kind of trend is the rapid emergence and acceptance of *information technology* (IT), not only in the marketing channel, but also in the homes of consumers (Wierenga, 1996). IT makes it possible to monitor the fickle consumer and translate his or her revealed preferences and behavior into action. Increasingly, consumers will also use IT at home. Virtual (electronic) shopping is expected to grow fast in the future. This will give rise to whole new distribution systems, based on virtual shops with efficient logistics to move the products to the homes of the consumers. Information technology will make it possible to deal with the increasing fragmentation in consumer behavior by enabling suppliers to deliver tailor-made baskets of food to specific consumer segments. In the future, consumers who want specific types of food can be traced easily through their customer card or Internet connection (Wierenga, 1996). IT allows the time-harassed consumer to do his or her shopping faster and at any time of the day or night.

Growth in food consumption in the next decade will be fueled to a large extent by these specific trends. Since many of these trends occur in multiple countries, albeit to a different degree (e.g., Germans are relatively more ecologically conscious while British attach more importance to animal welfare), this gives rise to the emergence of pan-European, and perhaps even global, segments.

Table 7 summarizes the trends and provides examples of marketing opportunities emanating from each trend. If an opportunity can be linked to multiple trends, it was associated with the trend to which it was most closely linked. Combinations of trends should further increase the potential of particular opportunities. For example, health-oriented working females are expected to have an even greater interest in gas-packaged fresh salads than health-oriented nonworking females or working females who are less concerned with their health. In sum, it is believed that companies that creatively respond to these trends in consumer behavior by developing specific products and marketing concepts for particular groups of cross-national consumers are likely to capture the growth markets of the future.

7. Conclusions

This paper developed a model for consumer behavior with respect to foods, and used it as a framework to discuss the food consumer literature. A distinction was made between the consumer decision process and three categories of factors influencing this decision process. We discussed theories and findings concerning different elements of our model, including the four stages of the decision process (need recognition, search for information, evaluation of alternatives, choice of a food product), and the various factors influencing this process, such as the physiological and sensory effects of the food consumed, biological, psychological,

and sociodemographic characteristics of the consumer in question, and the influence of three broad types of environmental factors, viz. economic, cultural, and marketing factors.

Table 7: Some trends in international consumer behavior and related market opportunities

Trend	Opportunities
Polarization: shopping versus enjoyment	store brands long-term contracts with retailers gourmet food exotic and ethnic food luxury foods
Increasing fragmentation of the market	wider assortment lifestyle products branding value-added products
Growing time pressure Increasing female employment	convenience products frozen products ready-to-eat foods gas/vacuum packaged fresh foods high quality products
Growing health concerns	low calorie and light products low cholesterol products natural products fresh foods, salads
Growing environmental and ethical concerns	free range meat regional products IKB "process-oriented" quality natural porduction creating a new agricultural system
Increase in food-away-from home consumption	foster relations with organizations in this market value products
Emergence of information technology	decline of market power of traditional retail chains increased importance of logistics easier to cater to the capricious consumer

From our review, it is evident that there exists an impressive body of research with respect to many elements of our model of food consumer behavior. However, most of this research has concentrated on a single factor or a couple of related factors

within the same broad category. Given the complexities inherent in studying food consumer behavior this is understandable. Within each (group of) factors, many questions still need to be addressed. For example, what are the health and satiation effects of olestra (a synthetic oil developed by Procter and Gamble that passes through the intestines undigested), and how will it affect consumer choices? Will it reduce obesity or will it lead to compensatory behavior? Are domain-specific lifestyle segmentation schemes, such as Grunert et al.'s (1993) instrument, more strongly related to food-related attitudes and behaviors than general lifestyle segmentation schemes? How can we explain cultural taboos given that neither the functionalist nor the structuralist view is fully satisfactory?

An even more challenging task is to move to research involving multiple factors, from different categories. Repeatedly, it has been pointed out that different variables interact, and that a comprehensive approach would add considerably to our understanding of the food consumer. There is a lack of research that takes a broad approach, aimed at integrating factors from several categories. Developing an integrated research program is a major challenge for food consumer behavior research in the future. Such a program may be expected to contribute to more effective marketing strategies as well as to more effective nutritional information and education programs, among others. Numerous interdisciplinary issues warrant investigation, including the following four issues.

First, future research should investigate how physical characteristics of the product and social/cultural factors *jointly* shape perceptions of foods. This involves an extension of the psychophysical model to include social psychophysical cues as well. Research along these lines is of great importance for new product development as it links marketing, R&D, and food technology, thus increasing the chances of a successful product introduction (cf. Hauser and Simmie, 1981; Steenkamp and Van Trijp, 1996).

Second, the interaction between cognitive factors, cultural factors, and physiologically-induced effects needs research attention. It will be important in determining the demand for and effectiveness of low-calorie products, and dieting programs in general.

Third, physiological influences may act as situational variables in consumer behavior (cf. Belk, 1975), and interact with other determinants in shaping food perceptions. For example, consumers tend to buy more when they are hungry than when they are satiated. Physiological factors also affect psychophysical relations (see Huber et al., 1982, for one of the few marketing studies). Despite the obvious implications (e.g., retail environment, sport drinks), interactions involving physiological factors have not received much attention by consumer behavior researchers.

A fourth research issue concerns cross-cultural research on determinants of food consumer behavior. Although cross-cultural research evidence was reviewed in this paper, our knowledge is still partial, sketchy, and confined to a small number of (Western) countries. For rigorous testing of consumer behavior paradigms, and for effective marketing of foods, a deeper understanding of similarities and differences between food consumers in different countries is necessary.

Notes

[1] Catholic University of Leuven, Belgium and Wageningen Agricultural University, The Netherlands

[2] This is consistent with the Fishbein model, in which all types of beliefs can be included (Peter and Olson 1993). From a means-end chain perspective, one of the oldest attitude models, viz., Rosenberg's (1956) expectancy-value model, has the most valid specification. Means-end chain theorists have always claimed that only beliefs about attributes that are related to valued states are relevant determinants of the affective state toward a product, and this notion is captured precisely in Rosenberg's two components of perceived value instrumentality and value importance (Sheth 1972).n which all types

[3] The classification of sensory perception as property of the food is somewhat ambiguous. In principle, sensory perception entails an interaction between the product and the consumer. Shepherd (1985) categorized it as a person-related factor, while Randar and Sanjur (1981) placed it under food properties, and Pilgrim (1957) assigned it a separate category in his model. As sensory perception appears to be rather homogeneous (e.g., people tend to perceive the same sweetness, although their liking of the amount of sweetness may differ; see also DeGraaf 1988), the properties of the food are the predominant factor in sensory perception, and therefore we categorize it as a food-related factor.

[4] Psychophysics studies the relationship between sensory perception and physical characteristics of the product. Another stream of research deals with the effects of cognitive cues (e.g., brand name, price) on sensory perceptions (see Steenkamp 1989 for a review and meta-analyses). Much of this research tends to be rather exploratory and no unequivocal conclusions can be drawn yet.

[5] It could be argued that income is a personal factor (cf. Randall and Sanjur 1981). However, for most people, individual incomes are determined by general economic conditions and therefore, it is discussed as environmental factor.

[6] There are some exceptions (e.g., Flanders, England) but these areas were nearly completely resettled by German tribes after the fall of the Roman Empire.

[7] Note that the basis for the percentages in Table 5 are the consumers who are aware of the store brand in the supermarket chain frequented by them. Therefore, the position of manufacturers' brands is somewhat better than suggested by the Table. If we assume that all consumers who are not aware of store brands consider store brands to be less expensive and of lower quality, and to inspire less confidence, the results for the five countries combined would be:

	Expensive	Quality	Confidence
More	2	4	5
Same	15	61	57
Less	83	35	38

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9 THE IDENTIFICATION OF SENSORY DIMENSIONS OF FOOD PRODUCTS FROM SCANNER DATA USING THE STUNMIX METHODOLOGY

Michel Wedel[1]

1. Introduction

1.1. Identification of Sensory Dimensions from Scanner Data

The purpose of this paper is to identify sensory dimensions underlying consumers choices of food products registered in a scanner panel, and to simultaneously identify segments of consumers with different food preferences. This will be accomplished using a new multidimensional scaling (MDS) model. In marketing research MDS is used to identify perceptual dimensions underlying the overall judgements of food brands by consumers. MDS models have been employed extensively in sensory- and food research to uncover the sensory dimensions of taste and odor stimuli (cf., Schiffman and Beaker, 1986). The use of MDS models allows for the identification of sensory dimensions without the need to rely on subjective and conceptually incomplete lists of verbal descriptors. It is highly unlikely that the relevant dimensions can be identified with such adjective descriptions, since in general a sufficient human vocabulary to describe the sensory processes of taste and smell is lacking (Schiffman, Reynolds and Young, 1981, p.20). Whereas in marketing research predominantly observational data obtained from consumers are utilized, in sensory research data are obtained in experimental settings from carefully trained experts. As a consequence in sensory research sample of experts have been assumed homogeneous, whereas in marketing research recently emphasis has been on capturing consumer heterogeneity through the identification of segments. In both marketing and sensory research the revealed dimensions are often related to physical attributes of the (food) products in a second step of the analysis, in order to facilitate product development and repositioning. Recently, there has been an increase in the interest, both in academia and practice, to integrate the two fields. The purpose of this study is to demonstrate that a class of new MDS models

can be used to uncover sensory dimensions from observational scanner panel data, thus bridging the fields of marketing and sensory research.

Scanner panel data are purchase data for individual consumers, collected at the check-out counters of supermarkets, using bar-code scanners. Here, scanner data from canned soups will be analysed. The canned soups variety is a popular and frequently purchased category in the USA, with close to one-hundred different flavours or combinations of flavors. For the purpose of our analyses, the scanner data need to be processed in a way that deviates from common practice in marketing research. Here, scanner data are aggregated by brand, to uncover the perceptual dimensions underlying brand purchases. In order to enable the identification of sensory dimension, the scanner data are aggregated into flavors and flavor-types. The data analysed constitute the frequency with which each panel member has purchased a specific flavor of soup over a one-year period. These purchase frequencies thus accumulated are modelled using the assumption that they follow a Poisson distribution. To this end, a multidimensional scaling model is used, that starts from the premise that sensory dimensions underly the purchase frequencies of soup-flavours. The purpose is to identify these underlying sensory dimensions from the data, while accommodating heterogeneity in the purchase rates is by simultaneously identifying segments. In the next section, MDS models will be briefly introduced.

1.2. MDS Unfolding models

Multidimensional scaling (MDS) is a class of multi variate statistical methods developed to describe peoples perceptions of objects (or stimuli) as multidimensional spatial structures.

For the purposes of MDS analyses, two types of data may be collected: proximity data (indices defined over pairs of objects that quantify the degree to which the objects are alike), or dominance data (indices defined over sets of objects that quantify their relative degrees of superiority). This paper focusses on dominance data, typically preference or choice data, contained in a persons-by-stimuli two-way data matrix. The spatial models for dominance data are often called unfolding models. In these models, the stimuli are represented by their coordinates on a number of dimensions characterising them. Ideal-point coordinates on the underlying dimensions for each subject specify that combination of stimulus characteristics that the subject considers ideal. According to the (simple) ideal-point model a subjects preference for a stimulus object decreases as a function of the (Euclidian) distance of the object from her/his ideal. An extension of this model is the weighted ideal-point model, which allows for differential weighting of the dimensions by each subject. Alternatively, a vector model can be specified, in which preference vectors are estimated for each person, indicating the direction in which her/his liking for the stimuli increases along the dimensions. Unfolding models have

been applied in a variety of scientific disciplines, and have been rather important in both sensory research and marketing research.

A limitation of previous unfolding procedures (for example PREFMAP) however, is that they are deterministic, in that they do not account for measurement error in the data. In addition, they are not suited to provide a joint space representation for large samples of several hundreds of subjects, encountered in marketing research, for example in consumer panels. The ability of unfolding models to portray the structure in such volumes of data is limited. The derived joint spaces become saturated with subjects' vectors or ideal points, rendering interpretation virtually impossible. Often, to aid interpretation, the subject parameters are clustered in a second step of the analysis, where the interest focusses on the derived groups of subjects, or segments.

These limitations are alleviated in stochastic unfolding mixture models. In these models vectors or ideal-points of segments are directly identified in place of those of subjects. A review of these procedures was recently provided by DeSarbo, Manrai and Manrai (1994). They identified that the literature consists of a collection of independent special cases, where rather different model specifications and estimation procedures have been used. As a consequence it is difficult to choose the appropriate model for a particular application, while the desired options of a model may not be available.

The recently proposed STUNMIX model by Wedel and DeSarbo (1995) fills this gap. It presents a general methodology that integrates previously developed models. Moreover, the methodology encompasses a wide range of new models and options. The main advantages of STUNMIX over previous MDS models however, are that it allows for stochastic variation in the data, and that vectors or ideal-points of segments are identified in place of those of individual subjects, using a mixture model formulation. This is an effective way to model consumer heterogeneity as compared to a specific parametric form of that heterogeneity as e.g. in the Negative Binomial (cf., Wedel et al., 1993). The Poisson STUNMIX model in itself constitutes a new model, not published heretofore. The details of the model are provided in the next section.

2. The Poisson STUNMIX model

2.1. The Model

Let:
$i = 1,...,I$ index consumers;
$j = 1,...,J$ index stimuli (soup flavours);
$l = 1,...,L$ index subject descriptor variables;
$s = 1,...,S$ index segments;
$t = 1,...,T$ index sensory dimensions;
M_{ij} denote the purchase frequency of soup flavor j by consumer i;

x_{jt} denote the position of stimulus j on latent dimension t;
y_{st} denote the ideal point of segment s on latent dimension t;
A_{il} denote the l-th descriptor for consumer i;

Assume that the data on the J soup-flavors for a sample of I consumers, contained in $M=((M_{ij}))$, arises from a population which is a mixture of S segments in proportions $\pi_1,\ldots,\pi_S$. It is not known in advance from which segment a particular consumer arises. For these prior probabilities, π_s, it holds that:

$$[1] \quad \sum_{s=1}^{S} \pi_s = 1, \qquad \pi_s > 0, \qquad s = 1,\ldots,S$$

We assume that the conditional probability density function of M_{ij}, given that M_{ij} comes from segment s, is the Poisson distribution, taking the form:

$$[2] \quad f(M_{ij} \mid \mu_{js}) = \frac{e^{-\mu_{js}} \mu_{js}^{M_{ij}}}{M_{ij}!}$$

Conditional upon segment s the M_{ij} are independently distributed with means μ_{js}, which depend on unobserved segments. Now, a predictor is specified as a function of the means, using a log-link-function:

$$[3] \quad \eta_{js} = \log(\mu_{js})$$

The predictor is assumed to be produced by the locations of the stimuli on T unobserved dimensions $((x_{jt}))$, and by segment specific preference vectors with termini $((v_{st}))$ according to a vector model:

$$[4] \quad \eta_{js} = c_{js} + \sum_{t=1}^{T} x_{jt} y_{st},$$

or by ideal-points $((y_{st}))$ and (optional) weights $((w_{st}))$:

$$[5] \quad \eta_{js} = c_{js} - \sum_{t=1}^{T} w_{st} (x_{jt} - y_{st})^2$$

An additional methodological option accommodated in the STUNMIX model used here is simultaneous segment description. The prior probabilities of membership are constrained to be functions of subject descriptor variables, contained in the (IxL) matrix $A=((A_{il}))$:

$$[6] \quad \ln\left(\frac{\pi_{s|A}}{\pi_{S|A}}\right) = \sum_{l=1}^{L} A_{il} \alpha_l$$

where $\alpha = (\alpha_s)$ is a (Lx1) vector of coefficients. These constraints can aid in the interpretation of the derived segments. The model with c_{js} unconstrained and

including the spatial-structure component is not identified. One should impose one of three types of constraints in order to identify the model. A constant can be estimated either for each segment: $c_{js}=c_s$, or for each brand: $c_{js}=c_j$. Thus, overall differences in the purchase frequencies between segments or stimuli may be removed from the scaling model. Alternatively, the spatial-structure component of the model may be set to zero, whereby the unconstrained constants, c_{js}, can be estimated.

The unconditional probability density function of an observation M_{ij} can be expressed in the finite mixture form:

$$[7]\quad f_{ij}(M_{ij}|\mu)=\sum_{s=1}^{S}\pi_{s|A}f_{ij|s}(M_{ij}|\mu)$$

The parameters of the model estimated by maximizing the likelihood:

$$[8]\quad L(\alpha,\beta,c,X,Y|M_{ij})=\prod_{i=1}^{I}f_{ij}(M_{ij}|\alpha,\beta,c,X,Y)$$

over all parameters, utilizing the EM algorithm. The estimation procedure is not described here, for details see Wedel and DeSarbo (1995). The particular indeterminacies involved in estimating STUNMIX models affected by centering, scaling, and rotational invariance of the solutions are noted in Wedel and DeSarbo (1995).

When applying the STUNMIX models to real data, the actual number of dimensions T, and segments, S, is unknown, and has to be inferred from the data. The measure used here to determine T and S is Bozdogan's consistent AIC criterium, CAIC. Since the asymptotic properties required do not apply, we use the CAIC-statistic as a heuristic measure. The three-step procedure for model selection proposed by Wedel and DeSarbo (1995) will be followed here.

3. Analysis of soup-flavors

In this section, I provide the application of the STUNMIX model to uncover underlying sensory dimensions of 14 soup-flavors on the basis of scanner panel data on purchases of soups. The data used are the 1986 A.C. Nielsen scanner panel data on the purchase of soup in the Springfield MO market. A sample of 200 heavy users of soups was selected, and their purchases (in equivalent units) were aggregated by flavor over a one-year period (1986). Although a very large number of flavors exists in this market, the fourteen soup flavors (or combinations of flavors), accounted for over 90% of the purchase volume of soups (see Table 3). Four demographic and socio-economic variables are available for profiling the segments: INCOME (Household income in 14 classes of increasing income levels), HHSIZE (Number of members in the household), WORKHRS (Female head average number of working hours), EDUCATION (Female head education in 11 classes of increasing educational levels).

3.1. Model Selection

In order to determine the appropriate number of segments, a saturated STUNMIX-Poisson model was estimated for S=1 to 6. Table 1 presents the log-likelihoods, and the CAIC and Entropy-statistics for each of those models (an Entropy of 1 indicates that the segments are perfectly separated, an Entropy of 0 indicates complete overlap). Since the CAIC-statistic reaches a minimum for S=4, that number of segments was selected. (The algorithm was started with 10 different random seeds, to overcome possible problems of local optima; the likelihoods of the S=4 solutions were all within 1.5%). The Entropy of 0.848 indicates that the segments are well separated.

Table 1: Log-likelihood, CAIC and entropy statistics for the STUNMIX-Poisson saturated models

S	Ln-L	DF	CAIC	E_S
1	-3813.77	14	7752.66	-
2	-3502.56	33	7300.05	0.767
3	-3321.29	52	7107.32	0.796
4	-3172.23	71	6979.01*	0.852
5	-3099.75	90	7003.86	0.822
6	-3046.41	109	7067.00	0.823

* Denotes the minimum CAIC value

Next, given these 4 segments, the appropriate model and dimensionality were to be determined. For this purpose vector and (simple) ideal point models were estimated for T=1 to 3 dimensions. In all models, constants, cj, were estimated for each brand. Through the estimation of such brand-specific constants the overall differences in purchase frequencies between the soup flavors were removed from the perceptual dimensions, as such differences in overall usage intensity tend to confound the first dimension. Moreover, these constants capture the average differences in marketing activities across the flavors, insofar they might be present (note that the flavor-frequencies are aggregated across manufacturers and brands).

As a consequence, flavors that appear in the center of the plot tend to have a high purchase frequency across the entire sample. Because brand-constants are estimated, T=3 presents the saturated model. Table 2 presents the log-likelihoods and CAIC statistics for the vector and simple ideal-point models of different dimensionality. The two-dimensional vector model has the minimum associated value of the CAIC-

statistic (CAIC=6956.61, df=59), and this model was therefore designated as the most appropriate representation of the data.

Table 2. Log-likelihood and CAIC for STUNMIX vector and simple ideal point (S=4) models

T	Vector Model			Ideal-Point model		
	Ln-L	DF	CAIC	Ln-L	DF	CAIC
1	-3384.91	46	7180.94	-3289.21	47	6998.48
2	-3214.65	59	6956.61*	-3205.55	62	6965.23
3	-3172.03	71	6978.61	-	-	-

* Denotes the minimum CAIC value

3.2. Results

Figure 1 presents the derived perceptual configuration for the S=4, T=2, vector model solution. The relative locations of the soup flavors suggest that the first dimension separates Onion-combination flavours from Vegetable-combination flavours. This dimension separates Chicken-Vegetable and Beef-Vegetable on the one hand, from Chicken-Onion and Beef-Onion on the other hand. Interestingly, Oriental-flavored soups are close to these Onion-flavors, while the Onion-only flavor is located near the center of this dimension. This dimension appears to be a vegetable dimension, separating soups with a pronounced flavor (union-types) from those with a less pronounced flavor. The second dimension, which is almost perpendicular to the first, separates out the Clam-flavor and the Potato-flavor, from the Chicken-flavor soups: Chicken-Vegetable, Chicken-Noodle and, to a lesser extent, Chicken (on the lower end of this dimension). This dimension appears to be a meat/fish dimension, separating soups with a pronounced flavor (clam) from those with a more neutral flavor.

Soups with one flavor, such as Beef, Onion, Noodle, Vegetable and Chicken are positioned somewhat more close together in the center of the plot, suggesting that the underlying dimensions determining the choice of products are based more on soups that offer a combination of flavors. In the plot, Beef-flavors appear together, while the same holds for Chicken-, Vegetable-, Noodle-, and Onion-flavors (with exception of Onion-only). Nevertheless, a vegetable-nonvegetable dimension does not appear to be a major distinguishing sensory dimension for consumers, as has been found in previous sensory research (Schiffman, Reynolds and Young, 1981, p.122).

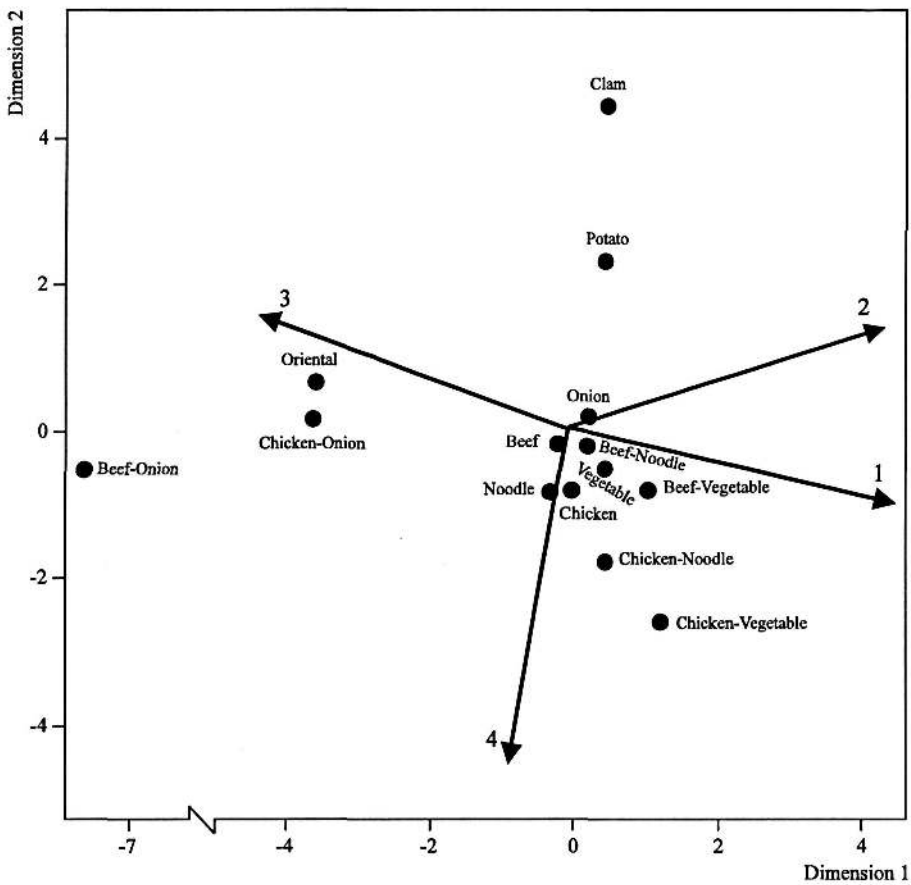

Figure 1: Two-dimensional STUNMIX solution for the soup data

The Entropy statistic (Es=0.828) indicates that the four segments identified are well separated. Figure 1 shows that the preference orders (obtained by projecting the soup-flavor coordinates onto the segment-vectors) for the for segments are markedly different. Table 3 presents the market shares of the 14 flavors in each of the four segments, and Table 4 the coefficients of the submodel, relating segment membership to the four consumer characteristics (the coefficients for the fourth Segment are restricted to zero for identification).

Table 3 shows that the market shares of the "basic" soup flavors that appear in the center of the plot, i.e. noodle, chicken, beef and vegetable, are relatively high in all four segments. The first and largest Segment, contains 40.5 percent of the sample. This segment appears to prefer soups with the Vegetable flavors, which is supported

by the high shares of these flavors in this Segment (Table 3). Table 4 shows that Segment 1 consists of consumers with smaller household sizes, and higher education, but with lower incomes, as compared to Segment 4. The second Segment consists of 26.3 percent of the sample. Among all segments, its preference for the Potato- and Clam-flavor soups is highest. Table 3 shows high shares for Potato and Clam, relative to the other segments. The share of Noodle-flavor soup is relatively low in this Segment

Segment 2 consists of a higher percentage of consumers with higher incomes, having higher education, and having smaller households (Table 4). The third Segment contains 22.9 percent of the sample. It prefers the Onion-flavor soups, as well as Oriental-flavor soup. From Table 3 it appears that these flavors have much higher market shares in Segment 3, as compared to the other segments. Table 4 shows that Segment 3 consists of a higher proportion of consumers with higher education, and having somewhat larger households. The fourth Segment is a relatively small segment (10.3 percent), with a preference mainly for Noodle and for Chicken-flavor soups. Table 3 shows that the market shares for noodle, chicken, chicken-noodle, and chicken-vegetable are high, relative to the other segments. The share of Beef-flavor soup is relatively low in this segment.

Table 3. Market shares of the soup flavors in 4 segments (%)

Flavor	*Segment 1*	*Segment 2*	*Segment 3*	*Segment 4*
Noodle	26.0	17.4	26.1	37.5
Chicken	20.8	16.3	15.9	23.1
Beef	15.8	17.1	17.0	10.2
Vegetable	12.8	9.8	5.5	6.3
Chicken-Noodle	8.6	4.0	2.8	11.9
Potato	3.3	13.3	2.3	0.5
Oriental	0.0	0.3	12.4	2.4
Clam	0.8	13.1	0.8	0.2
Beef-Vegetable	4.0	2.1	0.9	0.9
Onion	3.5	4.1	2.9	1.2
Chicken-Onion	0.0	0.1	6.2	1.7
Chicken-Vegetable	2.0	0.6	0.1	2.1
Beef-Noodle	2.3	1.7	1.9	0.7
Beef-Onion	0.0	0.0	5.2	1.2
Segment Size	40.5	26.3	22.9	10.3

Table 4: Coefficients of the STUNMIX submodel (S=4)

Variable	*Segment 1*	*Segment 2*	*Segment 3*
CONSTANT	-0.381*	-1.590*	0.116*
INCOME	-0.237*	0.140*	0.113*
HHSIZE	-0.112*	-0.347*	0.075*
WORKHRS	0.000	0.008	-0.012
EDUCATION	0.178*	0.121*	-0.007

* denotes $p < 0.05$

4. Discussion

The above analysis has revealed the sensory dimensions underlying consumers choices of flavors of soups. Segments of consumers were identified which differed in their preferences with respect to the underlying dimensions, and the background characteristics with which they were simultaneously profiled. The results thus support the potential of the proposed approach for identifying sensory dimensions from scanner panel data. However, a few drawbacks should be noted. First, the effects of marketing instruments is not accounted for. These effects may be expected to partial out to a certain extent for data aggregated by flavors over a one year period, while the flavor-specific constants in the model capture the aggregate (over time) effect of marketing efforts. For example, if noodle soup is frequently being promoted, it will have a high share across all segments, which due to the estimation of the noodle constant does not confound the position of soup on the sensory dimensions. In the future the STUNMIX model could be extended to simultaneously estimate response to marketing variables. A related model that does simultaneously deal with marketing mix variables is the multinomial choice model of Chintagunta (1994), that simultaneously includes the effect of marketing variables, and is estimated on scanner data.

Second, soup is a category that is used in a variety of usage occasions (as an appetizer, as a main dish, etc.), in which different (sensory) dimensions may be important. On the basis of panel scanner data, no distinction can be made among different usages of products. Nevertheless, the STUNMIX model may accommodate different importances of dimensions in different usage situations to a certain extent. The model has identified some overlap between the segments on the basis of the posterior probabilities. This overlap may be caused by consumers belonging to different segments, depending on differing usage goals of the product (see e.g. Wedel and Steenkamp, 1991). Third, when substantial switching between limited sets of flavours occurs as a result of variety seeking rather than as the result of

communalities in sensory perception, these flavors will occur close together in the map, potentially hampering the appropriate interpretation of the dimensions. Finally, for the specific data set at hand no physical characteristics of the various soup flavors were available that could have been used for simultaneous property fitting. Therefore, the analysis yields indirect guidance on which physical aspects should be used to alter existing, or design new products. The STUNMIX methodology, however, does allow one to reparameterise the locations of the stimuli by their physical features, if available, and thereby, allows the desired physical attributes for modified or new products to be derived from the perceptual maps. This feature is useful in designing and repositioning food products (soups), since given the coefficients of the stimulus descriptor variables, several alternative strategies may be formulated in terms of the physical attributes, and their effects on the map and the resulting market shares computed and compared. Alternatively, sensory evaluations of the flavors by an expert panel could be used to simultaneously profile the dimensions, which would aid in their interpretation. Thus, the STUNMIX model allows one to evaluate the effects of food-product modifications on the sensory dimensions underlying the actual purchase behavior of segments of consumers. This is left for future research.

Notes

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10 QUALITY LABELING AS INSTRUMENT TO CREATE PRODUCT EQUITY: THE CASE OF IKB IN THE NETHERLANDS

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1. Introduction

In response to the problems associated with intensifying competition and slow growth in the demand for food, European businesses increasingly attempt to add value to the agricultural raw material. To adopt a successful differentiation strategy, they must make the transition from the well-known product-oriented approach to marketing (based on homogenization, and cost minimization through economies of scale) to a consumer-oriented approach (identifying and meeting the needs of particular groups of consumers). The best performing companies demonstrate an unwavering focus upon the market place and relate all their operating decisions to the dictates of customer needs. The strategic reorientation of agribusiness coincides with consumer trends demanding higher quality than ever before. Therefore, differentiation on product attributes that consumers deem important may be a viable strategy to agribusiness.

There are multiple ways in which agribusiness companies can add value to the food product, such as more extensive processing of the product, employing certain production techniques, including ecological farming and animal friendly raising of livestock, as well as branding of the product. Another possibility is quality certification or labeling. Agricultural economists have long been interested in quality grading (e.g., Miller, Topel and Rust, 1976; Zusman, 1967). Quality labeling, which implies that a product only gets the certificate in question when it meets a set of specific requirements can be regarded as a particular type of quality grading. A quality label can successfully be used to differentiate between product offerings, provided that the label signals superior quality to the consumer. It assists the imperfectly informed consumers in their decision process because it structures

the information environment. Support for the potential of quality labeling to add value to the product can be found in several studies. For example, Steenkamp (1986) found in the context of meat products that quality labeling increased consumers' perceptions of the food product's quality, especially for unbranded products. Oude Ophuis (1994) reported that free range pork received more positive sensory evaluations than regular pork in the labeled condition although consumers did not perceive taste differences in a blind test.

One product category for which quality labeling may be particularly useful is pork. In the Netherlands, as well as in most countries, pork is currently a fairly homogeneous product category, with few, if any, brands. Price plays a major role in this market (in Dutch the cob-web cycle is called pig-cycle). Pork also has a rather bad image, compared to other types of meat (Van Trijp, 1991). In response to this unfavorable situation, the Dutch Product Boards for Livestock, Meat and Eggs introduced the system of Integrated Quality Control ("Integrale Keten Beheersing: IKB"). This IKB certification aims at providing quality guarantees for pork. The IKB scheme for pigs contains a number of basic minimum requirements which must be satisfied to qualify for IKB certification. These requirements relate to traceability (by means of the Identification & Registration system), feed, hygiene and the use of veterinary pharmaceuticals. These requirements were partly based on previous research among consumers, channel participants, and producers. Two main purposes of the IKB program are to better organize the production chain, and to provide value to consumers.

The purpose of this paper is to examine whether and, if so, how an IKB label will add value to pork in the eyes of the consumer. We propose a theoretical framework for analyzing added value using quality labeling. In particular we focus on those elements of consumer behavior with respect to meat that may be influenced through the availability of a visible label which indicates the IKB quality guarantee. Such insight is of paramount importance in the understanding of added value and consequently in the decision whether or not to use the IKB label as a vehicle for communicating with consumers, and to increase product differentiation.

The structure of the remainder of the paper is as follows. Section 2 describes the theoretical background in terms of relevant elements from the brand equity literature. Section 3 describes the methodology adopted and section 4 contains the results. Section 5 provides the discussion of the results and the implications for the meat sector.

2. Conceptual model of IKB equity

We call the value added to the product by the virtue of it having the IKB label "IKB equity". The IKB label provides value to the consumer because it guarantees that the pork is produced in accordance with the IKB criteria. More specifically, it is the set of assets linked in the mind of the consumer to the IKB label (cf. Aaker, 1991).

These assets add to the value provided by a product (i.e. pork) in the eyes of consumers. Note that the consumer will only value IKB when its criteria are relevant to consumers.

The issue of consumer value of the IKB quality label has some similarity with branding as a marketing strategy. For that reason we build on the existing literature on branding and brand equity as the guiding principle of our analysis of the IKB vignette at the consumer level. Figure 1 depicts our conceptual model of the sources and consequences of IKB equity. The set of assets on which the added value of the IKB label is based, can be grouped in three categories: awareness, perceived quality, and IKB associations. These categories were derived from Aaker's (1991) work on brand equity. Two types of consequences are distinguished, viz. consequences at the level of the consumer (quality risk reduction and commitment), and consequences at the level of the firm (consumption and prices/margins).

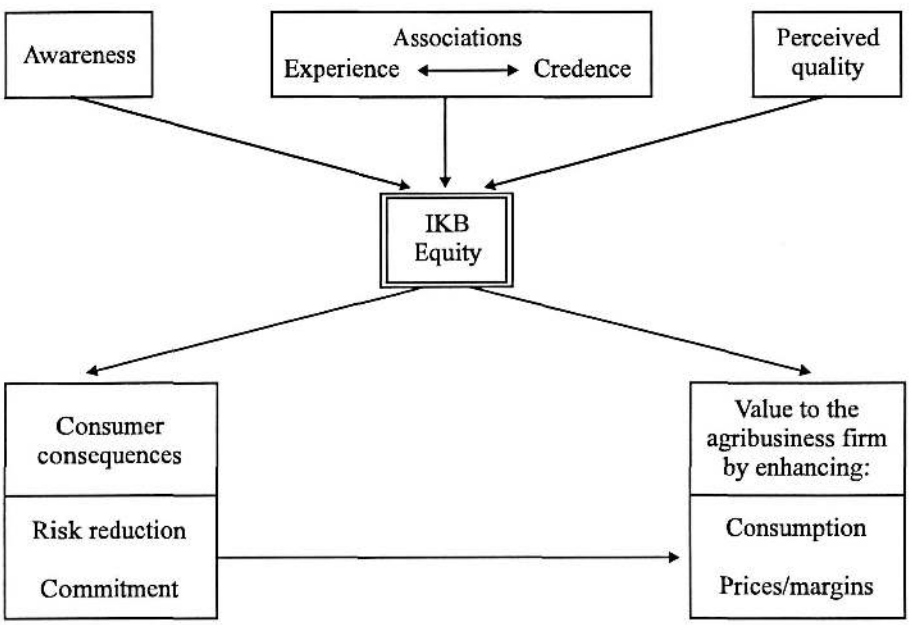

Figure 1: The conceptual model for sources and consequences of IKB equity

2.1. Awareness

For most people, food products are relatively low involvement products. They are relatively unimportant, are not of continuous interest to consumers, do normally not entail significant risks, and have limited emotional appeal. The consumer decision process is rather simple. Consumers do not actively search information, and their

buying behavior is frequently characterized by habit. They spend minimal time and effort in choosing among product alternatives. In such a situation, awareness plays a critical role. Awareness is the ability of the consumer to identify (recognize or recall) the IKB label/concept in sufficient detail to consider it in the decision process (cf. Rossiter and Percy, 1987). Hoyer and Brown (1990) found that awareness serves as a frequently used choice tactic in situations involving common repeat-purchase products, such as food products. Awareness was sufficient to make a choice, and consumers tended to choose the known product alternative, even if taste tests suggested it was of lower quality than the other choice alternatives (Hoyer and Brown, 1990).

What kind of value does awareness provide to consumers? First, a consumer cannot buy IKB pork unless he or she is first made aware of it. Thus, it is not surprising that awareness is strongly correlated with market share (Engel and Blackwell, 1982). Further, awareness provides a sense of familiarity, and familiarity, on its turn breeds liking (Janiszewski, 1988; Zajonc, 1980). People typically buy familiar products rather than unfamiliar products because it is easier, less risky, and it saves time.

2.2. Perceived quality

Perceived quality can be defined as the consumer's perception of the fitness for use of the product with respect to its intended purpose, relative to alternatives (Aaker, 1991; Steenkamp, 1989). Perceived quality is an overall unidimensional evaluative judgment about the brand (Steenkamp, 1989). Consumers perceive the quality of products in terms of "poor" or "good." It exists on a continuum rather than being a dichotomous variable. The quality of a product can range from very poor to very good. Further, perceived quality is an overall unidimensional judgment. It is a higher level abstraction, based on a number of underlying dimensions which include characteristics of the product. To understand consumer judgments of the quality of IKB pork, it is important to study the underlying dimensions (see below under "Associations") but perceived quality itself is a global, summary construct.

It is important to emphasize that the quality as perceived by the consumer rather than the "objective" quality influences the consumer's decision process. Research has found that perceived quality is a crucial variable in the consumer's decision process (Steenkamp, 1989). Superior quality is an effective product differentiation strategy to create customer loyalty, to lower price elasticity, and to present barriers to competition (Porter, 1980). Empirical studies have consistently found that higher perceived quality positively affects market share, selling price, and profitability (Buzzell and Gale, 1987). Moreover, consumers are demanding higher quality than ever before, and are willing to pay more for better products. For example, Steenkamp and Van Trijp (1989) found that perceived quality of pork had a significant influence on the maximum price the consumer was willing to pay for the meat cut in question. Creating a high quality position allows pork producers to

escape the price competition that rules this market. Hence, perceived quality is a key component of IKB equity.

2.3. Associations

An association is everything that is associated or linked in memory to the concept. For example, is IKB pork seen as tasty, healthy, expensive, etc.? The total set of associations defines the image of IKB. These associations play a crucial role in the consumer decision process because they form the bases for purchase decisions.

Associations can create value to consumers in several ways (Aaker, 1991). First, associations help consumers in their decision process. For example, if IKB is strongly associated with "healthy," a consumer does not have to process various aspects that relate to healthiness each time he or she buys pork. Second, associations form the basis for product differentiation. IKB pork may be differentiated from "regular" pork on aspects on which regular pork has a bad image. Third, particular key associations provide a reason to buy the product. If a certain consumer cares particularly much about animal welfare and he or she is convinced that IKB pork rates higher than regular pork in this respect, this consumer will have a higher inclination to buy IKB pork. Fourth, some associations are important components of perceived quality, another aspect of IKB equity.

Numerous types of associations may be linked to a concept, including tangible product attributes, country/geographic area, life style, etc. For the purposes of the present paper, we propose to distinguish between experience versus credence associations (Steenkamp, 1990). Some associations can be regarded as experience associations since they can be ascertained on the basis of actual experience with the product. Some examples in the context of pork are taste, tenderness, ease of preparation, and whether the product is suitable for guests (the latter can be ascertained by observing the reaction of the guests!). Other attributes cannot be ascertained even after normal use for a long time, and/or without consulting an expert. Examples are the absence of additives, and animal-friendly production.

We treat the experience-credence dimension as a dichotomy. This conceptualization is adequate for our model of IKB equity, although we acknowledge that not all associations can be regarded as prototypical experience or credence associations. Some associations are easier to observe during the consumption process (e.g., taste) than others (e.g., reactions of others).

Credence associations are more difficult to counter by competitors than experience associations, because the former cannot be disproved upon consumption, and consumers cannot verify claims of competitors on credence aspects. For example, it is easier to "prove" that your product is good tasting than that the animals are treated well. Hence, we may expect that in the long run a relatively strong position

on credence associations contributes more to IKB equity than a relatively strong position on experience associations.

In sum, awareness, perceived quality, and associations form the basis of IKB equity. The greater the awareness of IKB pork, the higher its perceived quality, and the more positive the associations consumers have with IKB pork, the greater the value added to the pork by the very fact that it is IKB pork.

2.4. Consequences of IKB equity

One consequence of IKB is that it is likely to reduce perceived quality risk because it is a quality label. By perceived quality risk, we mean the amount of risk consumers perceive in the purchase decision because of the uncertainty about the decision and/or the potential consequences of a poor decision (Cunningham, 1967). The two components are commonly multiplied since the absence of either one would eliminate risk (Steenkamp, 1989). Since most consumers are risk averse, reduction of quality risk is a valued consequence.

Further, and potentially more important, is the fact that both perceived quality and brand associations can enhance consumers' satisfaction with the use experience (Aaker, 1991). Many of the quality criteria in the IKB program are not directly observable to consumers but knowing that the product has guarantees concerning hygiene, pharmaceuticals, etc. may enhance the usage experience, just like the mere knowledge that one drinks a well-known brand of beer gives more satisfaction (Allison and Uhl, 1964). The fact that IKB reduces perceived quality risk will also be a factor in the consumer satisfaction. Higher satisfaction with the usage experience should lead to a greater commitment to IKB pork (cf., Jacoby and Chestnut, 1978).

Reduced risk and increased commitment are hypothesized to have a positive effect on the consumption of IKB pork. More specifically, it is hypothesized that for consumers who attach much value to the IKB label, the relative proportion of IKB pork in the total consumption of pork will be higher, and, more speculatively, that for these consumers introduction of IKB will have a positive effect on the total consumption of pork (IKB plus regular pork). Moreover, price sensitivity may decrease for these consumers.

3. Methodology

A large scale consumer survey was carried out in close cooperation with the Dutch Commodity Board for Livestock and Meat.

3.1. Pilot study

Prior to the main study, a qualitative pilot study was conducted aimed at the development of the IKB-proposition in consumer terminology, as its formulation in

technical terms, necessary for quality control in the production chain, is clearly inappropriate for communication to consumers. A commercial market research agency specialized in qualitative research conducted three qualitative group discussions (total n=20). The participants were females who were primarily responsible for meat purchases in their households. In each of the group discussions, alternative descriptions of the IKB concept were discussed, where the concept was adjusted to the comments of the participants. In this way it was ensured that consumers actually understood the IKB proposition in a way that is in the spirit of the IKB-philosophy.

3.2. *Subjects and stimuli*

Based on the results of the pilot study, the IKB-concept was defined as: "IKB pork comes from authorized farms and slaughter houses where additional inspection is conducted on the fodder (including the use of medicines), transport and hygiene. The extra inspection is carried out by an independent organisation".

The main study was conducted among a representative sample of 505 Dutch households. In each of these households the member who carried main responsibility for the purchasing of fresh meat participated. For this purpose a two-stage cluster sampling technique was adopted based on the Dutch zip codes. Data collection took place in May and June 1993, using Computer Aided Personal Interviewing.

3.3. *Procedure*

Respondents were individually approached by telephone and asked if they were willing to participate in a survey on purchase and consumption behavior with respect to fresh meat. If they were willing to do so, the interviewer made an appointment for a personal interview. Subsequently, the interviewer approached the household with a computerized questionnaire. The use of computerized data collection is considered particularly appropriate because respondents generally like it and because it reduces interviewer bias.

As part of a larger data collection task, consumers were asked to indicate their purchase and consumption behavior with respect to meats. They were then asked to judge a number of meat products on a list of attributes including overall quality and evaluative and descriptive attributes. For the present context, the evaluation of pork is of particular importance. In addition, consumers were asked to indicate the distribution of their meat consumption across a number of meat products (pork, beef, poultry, fish, veal, lamb, minced meat, convenience meats and non-meat). For this purpose a constant-sum scaling techniques was applied in which consumers indicated the number of days during a 100 day period that they consume each of the different meat products.

Subsequently, consumers were confronted with the IKB-concept, and were asked a number of questions related to their primary reaction to the concept in terms of perceived need for such a concept and willingness to devote time and effort in obtaining IKB-pork. Next, subjects were asked their opinions about IKB in terms of overall quality, evaluative judgments and descriptive attributes. Subsequently, the reported consumption procedure with the constant-sum methodology was repeated, this time with IKB-pork included.

3.4. Measures

Perceived quality was operationalized through a five-point bipolar scale with end poles labeled 'poor quality' (1) and 'good quality' (5). Equity of IKB was operationalized as the difference in overall attitude between IKB and regular pork (Aaker, 1991), with attitude being operationalized as the mean score on three five-point bipolar scales with end poles labeled 'bad'-'good', 'not attractive-attractive', 'not pleasurable- pleasurable'.

The following associations were included: bad/good taste, tough/tender, fits with few/many dishes, difficult/easy to prepare, unsuitable/suitable for guests, fat/lean, not special/special, unhealthy/healthy, contains/free of hormones, contains/free of additives, not exclusive/exclusive, animal unfriendly/animal friendly produced. The first six associations could be categorized as experience associations, the last six as credence associations. These associations were based on previous research and the three group discussions[4].

The two components of perceived quality risk, quality uncertainty at the moment of purchase and the possible consequences of a wrong decision, were operationalized through the statements: "Quality of pork is easy to judge" and "Pork has constant quality," respectively. Both statements were scored on five-point Likert scales ranging from "completely agree" (1) to "completely disagree" (5). The overall perceived quality risk score was estimated by multiplying these two scores. Risk reduction was operationalized as the perceived quality risk of regular pork minus perceived quality risk associated with IKB pork.

Commitment to IKB was measured through five statements. These statements, all scored on three point scales with category labels "yes"(+1), "no" (-1) and "don't know" (0), were: (a) do you consider IKB a good thing?, (b) do you have a need for IKB?", (c) "Are you willing to pay some extra for IKB?", (d) Would you be willing to visit another shop to obtain IKB?, and (e) Do you think to increase your pork consumption under the influence of IKB? IKB-commitment was operationalized as the summed score on the five items, overall scores thus ranging from -5 to +5.

The constant-sum task allowed us to compute two different measures concerning consumption: the relative share of IKB-pork in total pork consumption, and the relative share of pork (IKB plus regular) in total consumption of meat after

introduction of IKB. Two elements are not included, viz. awareness and prices/margins. The IKB label has not yet been introduced and hence the IKB concept was described in the interview. Thus awareness is not an issue in this study. Prices/margins were not included on the explicit wish of the sponsor of this study.

4. Results

We first compare IKB pork and regular pork on the main components of our model: perceived quality, associations, attitude, perceived risk, and the relative share of pork (IKB plus regular) in total consumption of meat after introduction of IKB, using paired t-tests.

Next, we explore the relative effects of perceived quality and associations on IKB equity, using regression analysis. Finally, we explore the effects of IKB on its consequences, again using regression analysis. Because of the large sample size, we adopt the more stringent p=.01 level for significance testing to guard against trivial differences.

4.1. Comparison of IKB and regular pork on components of the IKB equity model

Table 1 shows the mean rating of IKB pork and regular pork on perceived quality, associations, attitude, perceived risk, and consumption intensity. It is found that IKB pork is perceived to be of better quality, and also has more positive associations than regular pork. The lack of a significant difference for the associations "fits with many dishes" and "easy to prepare" is encouraging. Indeed there is nothing in the IKB concept that would make a difference on these aspects. Hence these results increase our confidence that consumers made a conscious effort to respond to each item separately.

IKB adds value to consumers as is evident by the more positive attitude of consumers toward IKB pork. This is consistent with the differences between IKB and regular pork on most of the sources of IKB equity. As may be expected IKB reduces perceived quality risk relative to regular pork. Although consumers do not expect that the quality of IKB pork would be easier to judge, they are confident that the IKB quality guarantees will result in more constant quality levels, thereby reducing overall perceived quality risk. This finding lends support to the result that IKB most strongly differentiates on the credence attributes that cannot be directly verified upon consumption. Finally, it was found that the relative share of pork (IKB plus regular) in total consumption of meat after introduction of IKB increased by about 3% from 19% to 21.8 % (IKB pork: 13.37%, regular pork 8.43%).

Table 1: Comparison of consumer perceptions of IKB-pork relative to regular pork.

	IKB	regular	difference
IKB equity			
Overall attitude	4.0	3.4	0.6*
Product Quality			
good quality	4.4	3.7	0.7*
Experience attributes			
tender	4.1	3.8	0.3*
good taste	4.0	3.9	0.1
lean	3.3	2.9	0.4*
fits with many dishes	4.2	4.2	0.0
suitable for guests	3.8	3.5	0.3*
easy to prepare	4.5	4.6	-0.1
Credence attributes			
special	3.5	3.1	0.4*
exclusive	3.1	1.8	1.3*
healthy	3.8	2.7	1.1*
free of hormones	4.2	2.5	1.7*
animal friendly	4.0	2.4	1.6*
free of additives	4.1	3.1	1.0*
Quality risk			
Uncertainty	3.0	3.2	-0.2
Consequences	2.1	3.3	-1.2*
Overall risk perception	6.1	10.1	-4.0*
Consumption			
Total pork consumption (%)[1]	21.8	19.0	2.8*

* $p<.01$

[1] Note that these figures refer to the market share after and before IKB-introduction respectively

4.2. IKB equity and its sources

The relative importance of perceived quality and associations as sources of IKB equity was examined using regression analysis. As mentioned earlier, a respondent's

IKB equity score was obtained by subtracting the attitude score for regular pork from this person's attitude score for IKB pork. The person's perceived quality score was obtained in a similar way. The situation for the associations is slightly more complex. First, all associations were coded into the positive direction (see Table 1). This ensures that higher scores on that item are valued more by consumers (see also Van Trijp, 1991)[5]. Next, we computed a summary measure for associations by taking the difference between IKB and regular meat for each association and subsequently summing these differences across all associations.

The results of the regression analysis are reported in Table 2a. Both perceived quality (b= .21, p< .001) and associations (b= .45, p< .001) contribute significantly to IKB equity. However, the effect of the associations is considerably larger. This attests to the crucial role associations play in creating value to consumers (Aaker, 1991).

In our theoretical framework, we distinguished between experience and credence associations. To explore the contribution of these two types of associations, we computed two summary measures for associations, one for the credence associations and one for the experience associations. Table 2b shows the results of the regression analysis involving both types of associations as well as perceived quality. All three predictor variables had a significant influence on IKB equity. Experience associations (b= .36, p< .001) contribute more to IKB equity than credence associations (b= .22, p< .001). This is due to the greater importance of experience attributes in consumer judgment formation (Steenkamp, 1989). However, credence associations also have a significant effect, and in the long run, these associations could be a stronger basis for competitive advantage because they are harder to imitate. In any case, it is encouraging that IKB equity is supported by both types of associations as well as by perceived quality.

Table 2: IKB equity and its sources

	2A		2B	
	β	p	β	p
Perceived quality	.21	<.001	.20	<.001
All associations	.45	<.001		
Credence associations			.22	<.001
Experience associations			.36	<.001
R^2	.32		.34	

4.3. Consequences of IKB equity

One of the consequences of strong IKB equity is reduced quality risk. Consistent with this expectation, it was found that higher IKB equity had a significant effect on perceived quality risk reduction (b= .18, p< .001; see Table 3a).

Table 3: IKB and its consequences

	3A		3B	
	Risk reduction		Commitment	
	β	p	β	p
IKB equity	.18	<.001	.19	<.001
Risk reduction			.01	.83
R^2	.03		.04	

Another consequence that was distinguished in our framework is commitment. Higher IKB equity and quality risk reduction should lead to a higher commitment to the product by risk averse consumers. To test this hypothesis, commitment was regressed on IKB equity and risk reduction. It was found (Table 3b) that IKB equity had a significant effect on commitment (b=.19, p<.001), whereas quality risk reduction had not (b=-.01, p<.001).

Table 4: IKB and consumption

	Share IKB in total pork		Share (IKB+regular) in total meat	
	β	p	β	p
IKB equity	.14	.0011	.12	.0078
Risk reduction	-.01	.8648	-.04	.3464
Commitment	.49	<.0001	.24	<.0001
R^2	.29		.08	

IKB equity is also expected to provide value to the firm by enhancing consumers' pork consumption. The effects on two measures of consumption were investigated, viz. relative share of IKB-pork in total pork consumption and the relative share of pork (IKB plus regular) in total consumption of meat after introduction of IKB

(Table 4). The predictor variables in the regression analyses were IKB equity, and its consequences at the consumer level, i.e., quality risk reduction and commitment. Consistent with our expectations IKB equity and commitment had a significant effect on the share of pork (IKB plus regular) in total meat consumption (equity: $b = .12$, $p < .01$; commitment: $b = .24$, $p < .001$) as well as on the share of IKB in pork consumption (equity: $b = .14$, $p < .01$; commitment: $b = .49$, $p < .001$). However, our expectations with respect to risk reduction as a determinant of consumption were not confirmed.

5. Discussion and conclusions

The present study investigated the assets associated with quality labeling. Extending the work on brand equity (e.g. Aaker, 1991), we provided a theoretical framework in which the sources and consequences of quality labeling may be analyzed. We provided an empirical illustration in the context of quality labeling in the Dutch pork sector using the IKB-label. We showed that quality labeling for pork may enhance the competitive position of pork vis-a-vis other meat products: the total share of pork (regular and IKB pork) may be expected to increase with almost 3 percent after introduction of IKB. More importantly, however, we identified the underlying mechanisms at the consumer level that are responsible for the expected increases in pork consumption.

IKB-equity is based on three types of sources: awareness, perceived quality and associations. As the IKB-label was introduced as an experimental variable in our study to all consumers, awareness was not considered as, by definition, it is 100%. We showed that IKB pork outperforms regular pork on perceived quality, all credence associations and most of the experience associations. Both perceived quality and consumer associations made a significant contribution as sources of IKB equity. In terms of its consequences at the consumer level, we showed that IKB-equity reduced perceived quality risk and increased commitment to IKB-pork, which in turn contributed significantly to the explanation of observed increases in total pork consumption as well as the share of IKB in total pork consumption after its introduction.

Overall, our results suggest that quality differentiation using quality labeling may be a viable strategy for agriculture products. It provides added value to the raw material which ultimately may materialize in higher consumption and probably higher prices and margins. Consumer awareness for quality labeled products in the market is a necessary requirement for the assets of brand equity to materialize. The important implication is that quality labeling in itself will not be sufficient. Market introductions of quality labeled food products will have to be supported by promotional strategies aimed at establishing brand awareness as well as on communication of the unique selling points deriving from the quality guarantees associated with the label.

In the present study we investigated equity from labeling at the concept level. At the time of this research the IKB label had not yet been introduced into the market. The present approach primarily served as an "early warning system" for the introduction of IKB labeling as well as for the decision to communicate it to consumers. It is important to note, however, that the procedure outlined in this paper equally applies to quality labels already in the market. Such research would provide insight into important managerial questions, such as: Does our labeling achieve its purposes? At what level (e.g. awareness, associations, perceived quality, risk reduction, commitment) does it fall short? Is additional effort needed, in terms of criteria and communication?

In light of the slow growth in many agricultural markets, the intense competition at the supply side and the demanding consumers, it may be expected that quality differentiation will become an increasingly important strategy in agricultural marketing. In the Netherlands we see a growing activity in quality assurance and quality labeling for other meat types (IKB is now being introduced for beef and veal) as well as other agricultural products. Such quality programs require a joint and coordinated effort of many different actors in the production chain of agricultural products, as each of these steps influences the quality of the final product delivered to the consumer. Chain marketing (Meulenberg and Kool, 1994) may be a viable approach for achieving successful coordination.

Notes

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[4] The categorization of the associations special and exclusive is somewhat ambiguous. We categorized them as credence attributes since there is nothing in the physical product that directly indicates these associations nor can they be ascertained upon consumption (which is the case for an aspect like whether guests liked it). However, we also did the analyses with special and exclusive categorized as experience attributes and the results remained substantively the same.

[5] We checked this in the present study by correlating each association with overall attitude. This confirmed that the poles shown in Table 1 are generally preferred.

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MEANS-END CHAIN THEORY AND LADDERING IN AGRICULTURAL MARKETING RESEARCH[1]

11

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1. Introduction

European agribusiness companies increasingly attempt to add value to agricultural raw materials, in reaction to the problems associated with slow growth in the demand for food. To be successful, they must make the transition from the well-known product-oriented approach to marketing (based on homogenisation and cost minimisation through economies of scale) to a consumer-oriented approach (identifying and meeting the needs of consumers). As a consequence, consumer motivations underlying consumer behaviour have become a central consideration in the marketing of food products. Recently, means-end chain theory with its accompanying laddering research technique has been proposed as a new integrated way to study the relations between consumers and products. This approach offers great potential for the consumer-oriented marketing of agricultural and food products. The purpose of this paper is to introduce means-end chain theory and the laddering data collection method and provide an empirical application for beef.

2. Means-end Chain Theory

Means-end chain theory has proven to be very useful in understanding consumer behaviour. In it, products are seen as a means through which consumers obtain certain valued ends. The basic notion of the theory builds on earlier work by psychologists (Tolman 1932; Smith 1954) and economists (Abbott 1955; Norris 1941) who have long recognized that consumers do not want products for their own sake, but for what the product can do for or provide to them. Means-end chain theory is concerned with the content and structure of consumer knowledge, and the motivating effects of this knowledge. The conceptual model of means-end chain theory specifies that the consumers' subjective knowledge about product categories is stored in associative networks which are organised as means-end chains.

The key constructs in these networks are attributes, consequences and values of consumers. Attributes are properties of products that can be sensed, that is products have a particular form, colour, smell, taste, sound and so forth. Benefits refer to what the product is perceived as doing for or providing to the consumer. Values are intangible, higher-order outcomes or ends.

According to Gutman (1982), a means-end chain is a concept that seeks to explain how a product facilitates the achievement of desired end states. He assumes that consumers choose products with attributes which can produce desired consequences (any result accruing directly or indirectly to the consumer from his behaviour) and minimize undesired consequences. Consumers decide on the positive or the negative valence of a consequence on the basis of the ability of a consequence to help them achieve desired end states (values). This consequence-value linkage is one of the critical linkages in a means-end chain. Another critical linkage is the one between the consequences of product usage and the attributes of a product. On the basis of a learning process, consumers link specific attributes of a product to the positive or negative consequences of product use. In other words, consumers choose products because they believe that specific attributes of the product can help them achieve desired ends (values) by means of the consequences or benefits (means) (Reynolds and Gutman, 1988).

Each of the key constructs may be further dichotomised to allow a more detailed analysis of consumer knowledge structures: concrete and abstract attributes, functional and psychosocial consequences, and instrumental and terminal values (Olson and Reynolds, 1983). Concrete attributes represent tangible, physical characteristics of a product, while abstract attributes represent intangible, subjective characteristics. Functional consequences are directly experienced, tangible outcomes of product use, while psychosocial consequences are more personal and less tangible outcomes. Instrumental values are the cognitive representations of preferred modes of conduct or behaviour. Terminal values, on the other hand, represent preferred end-states (Peter and Olson, 1993).

As indicated above, attributes, consequences and values are hierarchically structured because attributes lead to consequences which, in turn, produce value satisfaction (Figure 1). In moving from the attributes upwards in the attribute-consequence-value chain (means-end chain), the level of abstraction of the constructs increases. Walker and Olson (1991) have suggested that in the six-level means-end chain, the three lower levels (concrete attributes, abstract attributes and functional consequences) comprise the product-knowledge of consumers, while the three higher levels (psychosocial consequences, instrumental values and terminal values) comprise the self-knowledge of consumers. This suggested distinction between the product and consumer is indicated in Figure 1.

For example, a consumer may want to buy beef without strings (concrete attribute), because he believes this beef is tender (abstract attribute). Since tender beef tastes

better (functional consequence), guests will enjoy and appreciate the meal more (psychosocial consequence), thus making them feel at ease (instrumental value) and contributing to their happiness (terminal value). In this sequence, we move farther away from the food product per se and closer to the consumer, thus linking the food product with the consumer. Individual means-end chains can be interrelated and jointly form an associative network. Such a network of interrelated means-end chains is called a hierarchical value map.

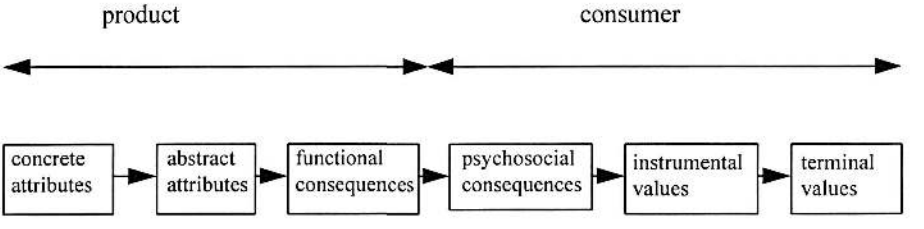

Figure 1: Means-end chain model

Means-end chain theory has served as an important conceptual framework in many studies in different domains, such as, marketing research (Klenosky, Gengler and Mulvey, 1993), advertising (Reynolds and Craddock, 1988; Reynolds, Gengler and Howard, 1995) and human resource management (Jolly, Reynolds and Slocum, 1988). Surprisingly, means-end chain theory has not attracted much attention in agricultural marketing research. Nevertheless, means-end chain theory can also be of importance for agricultural products. Traditionally, agribusiness managers have focused mainly on the product itself. Technological innovations stimulated a strategy in which product differentiation, large-scale production and cost reduction are emphasised, but such an approach has become less effective in today's saturated markets. Companies must try to meet consumer's needs better than their competitors. This requires taking into account consumers' purchase motivations. In this context, means-end chain research can be useful.

3. The Laddering Technique

Reynolds and Gutman (1988) introduced a depth-interview technique, called 'laddering', that makes it possible to uncover consumers' means-end chains. This laddering technique bridges the 'gap' between purely qualitative and predominantly quantitative research by seeking to formalise motivational relations obtained in qualitative interviews. In the laddering procedure three phases can be distinguished: (1) elicitation of salient attributes, (2) depth-interviewing, and (3) analysis of the results.

First, the attributes of the product, used by the consumer to judge, evaluate and compare products, are elicited via several available techniques (Steenkamp and Van Trijp, 1996a). The attributes serve as a starting point for the depth interview in which the consumer is continuously probed with some form of the question 'why is that important to you'. This type of questioning forces the consumer up on the ladder of abstractness, until the value level is reached or the consumer indicates that he is unable to provide any reason for his answer at the previous level. Figure 2 describes part of a laddering interview for beef.

interviewer: "You said that the absence of hormones is important to you in deciding what beef to buy. Why is that?" **(attribute)**

respondent: "Because I believe that if I buy beef without hormones, I am buying a wholesome product." **(consequence)**

interviewer: "Why is it important for you to buy a wholesome product?"

respondent: "Because I want to be healthy." **(value)**

interviewer: "Why is it important for you to be healthy?"

respondent: "Because when I am healthy I can enjoy my life more." **(value)**

interviewer: "Why is it important for you to enjoy your life?"

respondent: "It just is!" **(the end)**

Figure 2: Segment of a laddering interview for beef

Third, the data are analysed using a combination of qualitative and quantitative techniques. An analysis of the results of the interview is made in two stages. Through a categorisation process the results are reduced to a workable number of categories. With these categories, a so-called implication matrix is constructed, which indicates how many times an attribute, consequence or value leads to another attribute, consequence or value. On the basis of this matrix, a hierarchical value map is constructed, which is an aggregate representation of the motivational structure for the product in question. It reveals the links between product attributes, consequences and values. Based on the hierarchical value map, the next step in transforming the laddering data into useful information for marketing decision making is to determine the dominant perceptual orientations. That is, all potential pathways (connections among elements) must be examined to determine the relative strength of their association. These results give management an idea of the

motivations underlying the consumers' choice of a product with certain characteristics.

As suggested by Reynolds and Gutman (1988), a hierarchical value map, obtained by the laddering procedure can serve as a basis for various marketing actions, including segmentation, product-brand assessment and development of advertising strategies. Segmentation on the basis of the results of a laddering study allows us to classify consumers according to the values that are most important to them and helps us to gain a better understanding of the motivations underlying the behaviour of the food consumer. Segmentation of the market on the basis of consumer motivations can give insight into consumer requirements and offer guidance for product innovations. Consumer evaluation of agricultural products is another topic in which mean-end chain theory and the laddering technique can be of great use. It is easier for consumers to provide their evaluations of a product when they are allowed to use their own frame of reference rather than respond to some researcher-supplied set of attributes which may not be the consumer's own (Steenkamp and Van Trijp, 1996b).

Recently, attempts have been made to introduce brands for agricultural products. Successful brands offer a unique set of benefits to consumers for which means-end chain research can provide valuable input, among others by linking benefits for consumers to physical product attributes (relevant for product development) and to values (relevant for communicating the brand's unique bundle of benefits). In developing advertising strategies for agricultural products, laddering can serve as an important tool for guiding the marketing communication process. Consumers' cognitive structures for agricultural products can also provide guidance for technological innovations. It gives managers the possibility to translate product attributes into consumer needs, and reveals reasons for why certain product characteristics can be important for consumers.

In the remainder of the paper, we report an application of the means-end chain framework to a major agricultural product, that is, beef. The results are used to illustrate the usefulness of the framework and laddering for analysing consumer motivations in the context of agricultural products.

4. Methodology

Laddering was used to uncover the dominant means-end chains for beef. The data were collected in February 1995. As mentioned above, three phases can be distinguished in the methodology, that is, the elicitation of salient attributes, the depth interview and the analysis of the results.

4.1. Development of a Set of Salient Attributes

In our study, we deviated from the typical laddering procedure in that attribute elicitation and laddering involved different respondents, in order not to overlook

any key attribute of beef in the laddering interviews. Three approaches were used in conjunction to develop a set of salient attributes; First, twenty consumers were questioned extensively on their preferences for certain types of beef, their consumption of the product and the situations in which they consumed beef. Second, these twenty consumers completed a repertory grid task (Kelly, 1955). They were shown five different sets of three cuts of beef (in photographs) and for each of the five sets they were asked to pick out one cut that they found different from the other two in one or more aspects. The respondent was asked to verbalise these differences. Third, we conducted an extensive literature review on consumer behaviour with respect to beef. The final result was a list of twelve attributes, which was used as point of departure for the second phase of the laddering procedure, the depth interview.

4.2. The Depth Interview

Fifty women of different ages and from different social classes were interviewed in both Flanders (the Dutch-speaking part of Belgium, characterised by a Germanic culture) and Wallonia (the French-speaking part of Belgium, characterised by a Latin culture). All subjects were responsible for purchasing groceries for their households. Consumers were given a list of 12 attributes, and asked to indicate how important these attributes were to them on a 3-point scale (not important, rather important, very important). Three very important attributes and two rather important attributes were then chosen by the interviewer as point of departure for the laddering procedure. Since there was a high degree of agreement between respondents as to which attributes were most important, rather important attributes were also included in the laddering interview to elicit means-end chains for all attributes included in the attribute list.

4.3. Analysis

A reduction in the number of answers with a free response to a workable number of categories was necessary. This categorisation process was carried out separately for Flanders and Wallonia, by two judges, each native to the local culture. Inter-judge reliability was greater than 85%. For further analysis, we used the 'Laddermap' software, developed by Reynolds and Gengler (1989). This software makes it possible to construct an implication matrix, that is, a matrix which indicates how many times a certain attribute, consequence or value leads to another attribute, consequence or value. Figure 3 gives part[4] of the implication matrix. The implication matrix is a square matrix that displays the number of times each element leads to every other element (operationally defined as those elements in a row which precede other elements in the same row). The size of this matrix reflects the number of elements one is trying to map. Two types of relations are represented in this matrix: direct and indirect relations (Reynolds and Gutman, 1988). Using the laddering interview in Figure 2 as an example we can say that for this particular consumer there is direct link between 'beef without hormones' and 'a wholesome

product', whereas there is an indirect link between 'beef without hormones' and 'enjoy life' (through 'a wholesome product' and 'being healthy').

	hormone-free	without visible fat	tender	lean	without strings	succulent	natural	a thin cut	good quality	easy to prepare	easy to eat	attractive appearance	appetising	good taste	a wholesome product	enjoy eating	a healthy life	safety	an exciting life	happiness	friendship	feeling good	enjoy life	pleasure
hormone-free							16/1[1]		9/3		0/1	0/1	0/1	3/3	41/15	0/6	1/61	0/11	0/13	0/13	0/2	0/22	0/16	0/4
without visible fat			5/0				1/0		1/0	1/2	1/3	8/0	4/7	10/8	5/7	0/11	1/11	0/1	0/7	0/9	0/3	0/13	0/7	0/5
tender		1/0			3/0		1/0	1/0	2/2		14/5	1/1	1/4	12/5	0/2	3/19	0/5	0/3	0/1	0/6	0/2	0/7	0/9	0/8
lean			1/0				2/0	0/1	2/0	0/1		0/1	1/1	7/8	9/3	0/3	1/15		0/3	0/5	0/2	0/11	0/7	0/1
without strings				3/0			0/2	0/1		0/1	11/6	5/6	0/9	8/5	0/2	1/17	0/4		0/3	0/5	0/2	0/7	0/6	0/4
succulent				1/0	1/0		3/0	1/0	3/0	1/0	3/0	1/0	1/6	15/2	1/3	0/10	0/10	0/2	0/3	0/2	0/1	0/5	0/6	0/6
natural				2/2	0/1	2/0			3/0	1/0		0/2	1/1	2/2	10/2	1/3	7/13	0/4	0/6	0/4	0/0	0/5	0/3	0/2
a thin cut										14/2	2/3	0/2	0/2	7/12	1/1	0/15	0/4	0/1	0/1	0/7	0/1	0/7	0/6	0/7
good quality		1/0						1/0		0/1	0/1	1/0	1/0	8/5	13/1	4/5	9/14	0/5	1/8	0/7	0/2	0/8	0/11	0/5
easy to prepare				3/1	1/0						1/2	4/0	0/2	12/2	3/3	2/10	0/6	1/0	0/3	0/6	0/3	0/9	0/3	0/4
easy to eat									1/1	0/1		1/0	4/2	8/0	3/2	10/11	2/7	0/1	0/4	0/3	0/2	0/11	0/10	0/7
attractive appearance					0/1				1/0	1/1	1/1		12/3	3/1	0/2	1/10	0/5		0/3	0/3	0/1	0/5	0/2	0/5
appetising									1/0	0/1	1/0	1/0		2/1	1/1	8/2	6/4	0/1	0/4	0/7	0/2	0/6	0/4	2/6
good taste					1/0				4/0	2/0	6/2		8/1		3/2	40/6	0/10	0/2	1/7	0/14	0/5	1/16	4/12	7/13
a wholesome product											1/0		0/1	1/0		2/0	61/8	1/11	0/16	0/17	0/2	3/26	1/22	0/4
enjoy eating													1/0	3/0	1/0		2/5	0/3	2/3	3/8	1/5	12/5	10/6	12/2
a healthy life																		11/6	16/7	11/11	0/4	20/9	16/10	3/1
safety																	0/3		2/1	1/1	1/1	2/4	0/5	1/0
an exciting life																		1/0		5/4	0/2	6/1	4/0	1/0
happiness																					2/0		2/0	
friendship																				1/3				2/0
feeling good																		2/3	7/1	8/6	8/2		5/6	1/1
enjoy life																			1/1	4/1	2/0	2/0		2/0
pleasure																			0/1	2/1		0/2	5/0	

[1] Explanation: 16 respondents link hormone-free beef directly to more natural beef, while 1 respondent links hormone-free to natural, through intervening concepts.

Figure 3: Part of the implication matrix for beef in Belgium

On the basis of the implication matrix, the hierarchical value-map is constructed. First, we determine how many consumers must indicate the same link before we will consider this link as being important enough to be represented in the hierarchical value map (in the example for beef in Belgium we choose eight as the cut-off value[5]). The hierarchical value-map is the end-result of the laddering procedure. It represents the aggregate respondents' means-end structure for a certain product.

5. Results

Figure 4 represents the aggregate hierarchical value map for beef in Belgium. At the bottom of the figure, the product attributes are shown. These attributes are valued because they provide certain benefits in the eyes of the consumer. The benefits can help the consumer to reach desired end values which are represented at the top level of the map. The map indicates the most important links between the attributes, consequences and values, and gives an idea of the strength of these links by indicating how many consumers mentioned each link. Separate hierarchical value maps are also constructed for Flanders and Wallonia (Figure 5 and Figure 6). No substantial cross-cultural differences are found. Hence we concentrate on the results for Belgium as a whole.

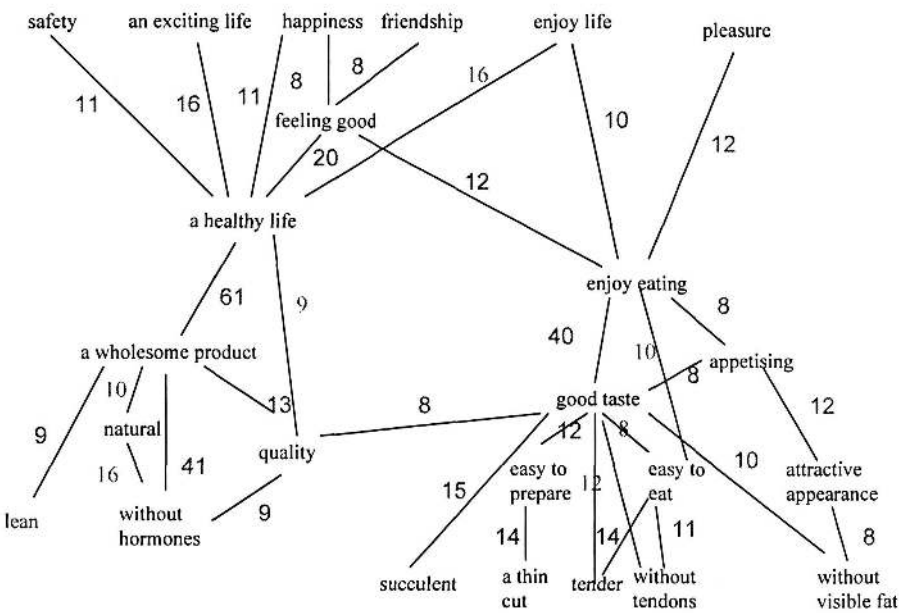

Figure 4: Hierarchical value map for beef in Belgium

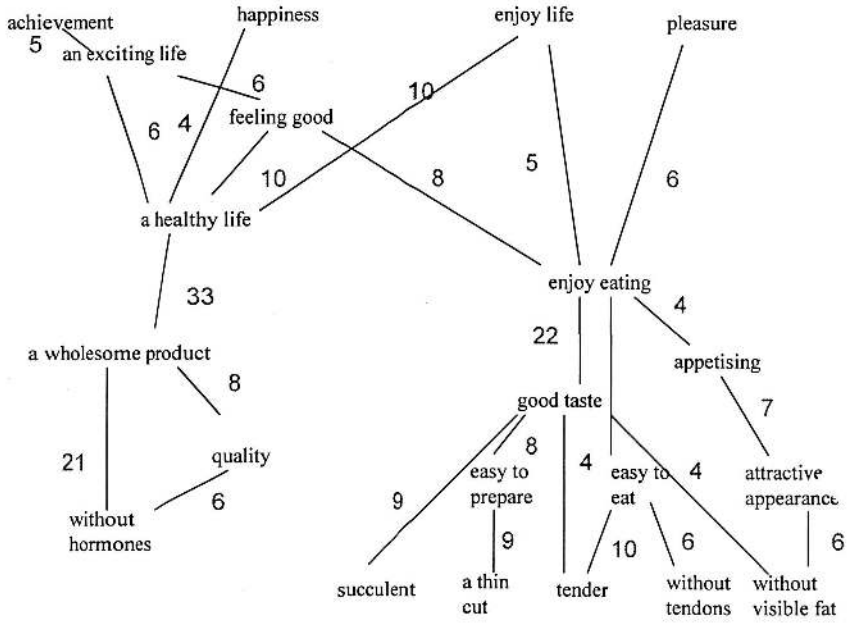

Figure 5: Hierarchical value map for beef in Flanders

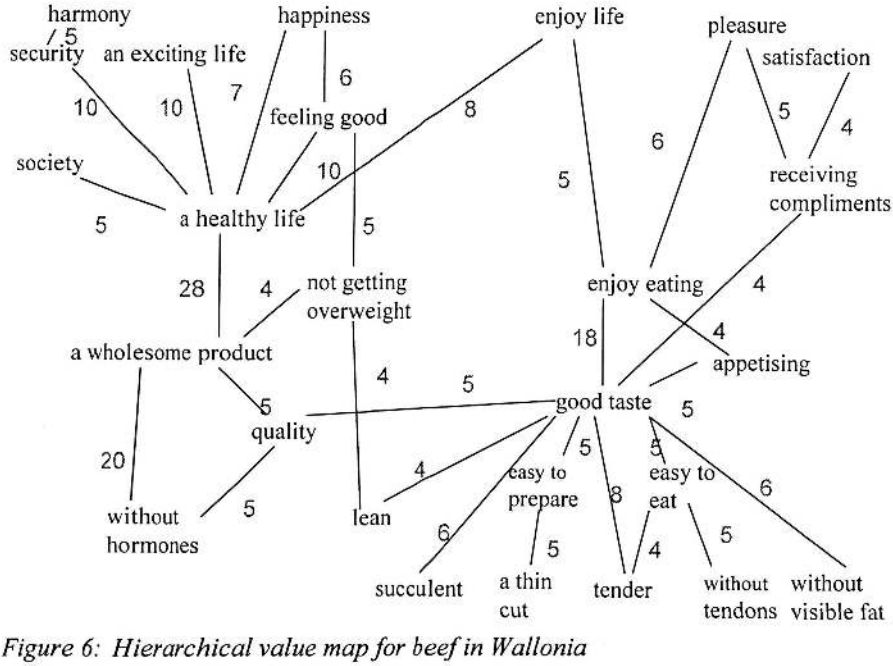

Figure 6: Hierarchical value map for beef in Wallonia

Inspection of the hierarchical value map for beef reveals that "taste" and "health" are the two key consequences of beef consumption. Taste has always been a

difficult concept in food research. However, laddering allows us to operationalise this concept in a more detailed way than the traditional procedures. In the map for beef, we see that many attributes contribute to a good taste experience. The succulence of a piece of beef, the thickness of a slice, the tenderness, the fat content and the absence of strings are very important for consumers. Eating enjoyment is primarily related to the taste experience and, to a lesser extent, to the visual experience. To enjoy eating makes one feel good, making it possible to experience pleasure and enjoy one's life, it also makes one feel better, which can lead to happiness and friendship.

Because of concerns about their health, consumers want wholesome products. Consumers consider beef to be wholesome if it is lean, of good quality and does not contain any hormones. Being healthy makes people feel safer and better able to have an exciting and enjoyable life. It makes people feel better, which makes them happier, making it easier for them to develop social contacts and experience friendship.

The link between hormone-free beef and a wholesome product is extremely strong, which indicates that people attach much importance to buying hormone-free beef. This extreme result indicates that the EU regulations for hormone-free beef correspond with consumers wishes. In sum, we see that consumers' motivational structure with respect to beef is primarily governed by a 'utilitarian', health-related motivation versus a hedonic, taste-related motivation. This parallels the basic distinction between utilitarian versus hedonic motivations in consumer behaviour (Holbrook and Hirschman, 1982).

6. Application

The market for agricultural products has changed from a producer-dominated market to a consumer-dominated market. In a consumer-dominated market, consumers decide which products they want, when they want them, in which packaging, with which characteristics and of which quality. For beef, much effort has been made to improve the product, but traditionally, product development has been guided by technical considerations ('product-focus'), without paying much attention to consumer motivations ('consumer-focus'). This product focus is not effective in consumer-led markets. It increases the risk of a mismatch between the physical characteristics of beef and the aspects consumers desire from beef. This mismatch may be the reason why millions of dollars are spent on improving product characteristics in which consumers are not really interested. A consumer-oriented marketplace calls for a consumer-led marketing approach. It is in this perspective that the means-end chain theory is very appealing. The information resulting from a means-end analysis can serve as an input for developing a consumer-led marketing strategy for foods. Below, we provide an illustration of some of the possibilities for beef.

The hierarchical value map can serve as a basis for *segmentation*, classifying respondents on the basis of their value orientations and the connection between the

attributes of beef and these consumer values. Table 1 includes a summary of the frequencies of the most important attribute-value links in the laddering study.

On the basis of these results we can identify three important segments of beef consumers. One segment is the *utilitarian segment* with 'absence of hormones'–'safety' as the dominant attribute-value connection. The second segment consists of *utilitarian-hedonic persons* for whom the values 'happiness', 'enjoy life' and 'exciting life' are linked (through intervening concepts) to both the 'absence of hormones' and taste components, such as, 'succulent', 'without visible fat' and 'without tendons'. In the third segment *hedonically-oriented* consumers link in their cognitive structures 'friendship' and 'pleasure' to the taste factors: 'succulent', 'thin', 'tender', 'without tendons' and 'without visible fat'.

Table 1: Ladder frequencies for attribute-value linkages

	VALUES					
ATTRIBUTES	safety	exciting life	happiness	enjoy life	friendship	pleasure
lean	0	3	5	7	2	1
without hormones	11*	13	13	16	2	4
succulent	2	3	2	5	1	6
thin	1	1	7	6	1	7
tender	3	1	6	9	2	8
without tendons	0	3	5	6	2	4
without visible fat	1	7	9	7	3	5

* This means that 11 people linked (through intervening concepts) the attribute 'without hormones' to the value 'safety'

The hierarchical value map can also give insights into *product or brand assessment.* It provides researchers with a better understanding of the basis upon which consumers make distinctions between different kinds of beef. It places the product class (beef) in the consumers' own context. Moreover, it provides some basis for the development of brands and a quality label for beef. From the hierarchical value map we gain some insight into what consumers consider as important characteristics of such a label or brand. Our study reveals that a quality label should, first of all, communicate the absence of (growth) hormones in beef. A major Belgian supermarket chain has recently introduced a quality label with exactly this claim. It is also of interest which attributes are not included because they are less important to consumers and are not related to salient consequences. One prime example is animal welfare. Despite the attention being given to this aspect in European media, the segment of people attaching much importance to animal welfare seems very small, at least in Belgium.

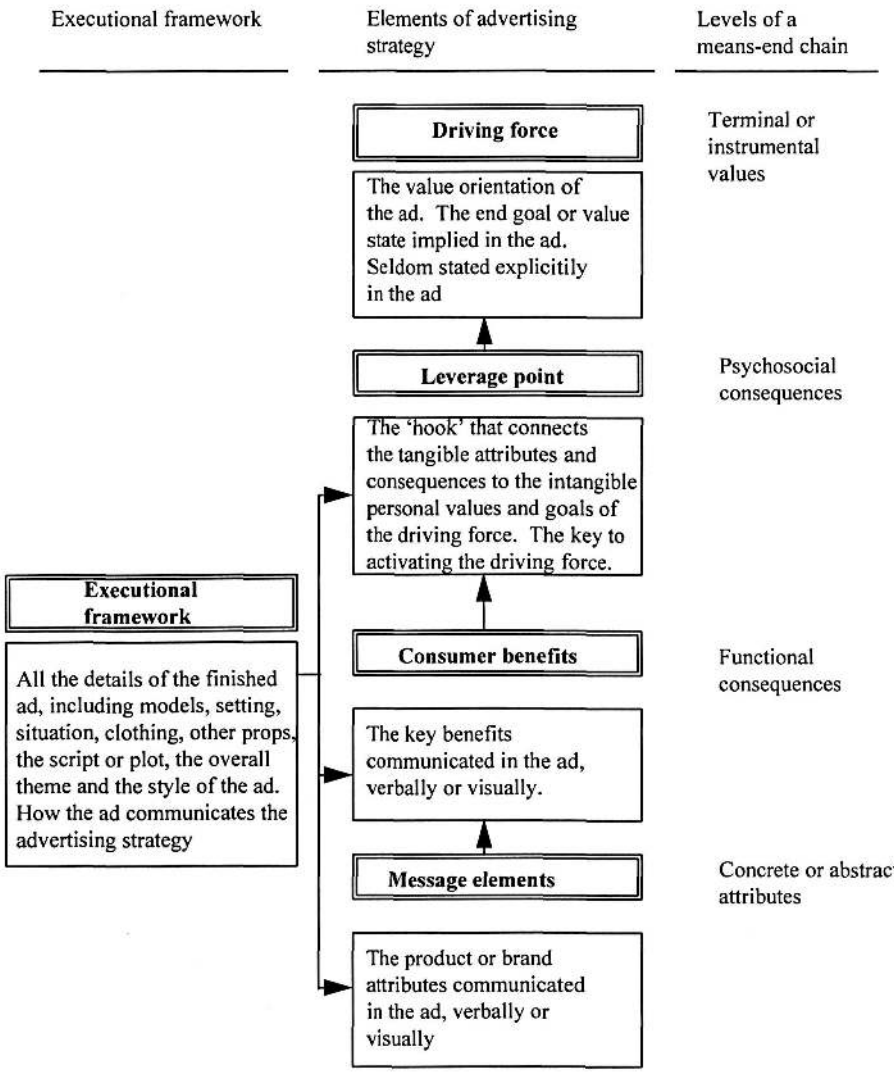

Figure 7: The MECCAS model (Source: Reynolds and Gutman, 1988)

We can also use the hierarchical value map as a tool for *advertising*. On the basis of the segments identified by the laddering-study, advertising can be directed towards a specific segment. Moreover, the perceptual constructs depicted in the hierarchical value map can be used as the basis for developing a strategy that will appeal to consumers with a particular orientation to beef (Reynolds and Gutman, 1988). Figure 7 shows the Means-End Conceptualisation of Components of Advertising

Strategy (MECCAS) model, defining four elements of advertising strategy, i.e., driving force, leverage point, consumer benefits and message elements (Reynolds and Craddock, 1988). These four aspects of the advertising strategy are based on analysis of consumers' means-end chains.

The product attributes found in the means-end analysis help marketers decide which information to include as *message elements* in the ad strategy. We will illustrate the MECCAS model for hormone free beef. For beef, guarantees concerning the absence of hormones, for example, can be stressed in an ad. As noted above, a major supermarket chain in Belgium is pursuing this approach. Knowledge of functional consequences which are important to consumers helps marketers identify the key *consumer benefits* to be emphasised. An important consumer benefit for beef without hormones is the perception that it is healthier. The *driving force* is the end value communicated by the ad. However, this end value is usually indirectly communicated. The end values most strongly connected with beef without hormones are 'safety', 'an exciting life' and 'enjoying your life'. The *leverage point* links the more concrete message including the attributes and functional consequences to the more abstract value level. The leverage point is a representation of an important psychosocial consequence. In our example, the healthy product, beef without hormones, could be linked to, for example, safety through 'living a healthy life'. The *executional framework* refers to the more creative details about how the ad will be produced.

7. Conclusion

Means-end-chain theory has attracted a substantial amount of attention from both marketing academics and practitioners. The in-depth profiling of consumers and their relationship to products offers not only potential for understanding the "cognitive" positioning of current products but also permits the development of positioning strategies for new products. Nevertheless means-end chain theory has been largely neglected in agricultural marketing. In this paper we argued that it can be of great use for marketers of agricultural products. It can assist them in their attempts to add value to their products by satisfying consumer needs.

Notes

[1] This project is supported by the Commission of the European Communities, grant no. AIR2-CT94-1066.

[2] Catholic University of Leuven, Belgium.

[3] Catholic University of Leuven, Belgium; Department of Marketing and Marketing Research of Wageningen Agricultural University, The Netherlands.

[4] The original implication matrix used in the study is a 55*55 matrix, however in Figure 3 we only report a reduced matrix, which incorporates the most important attributes, consequences and values. Note that the analyses were conducted on the full matrix.

[5] Note that the cut-off value can be varied to provide a more- or less-detailed view of the cognitive structure of consumers.

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CONSUMER SEARCH AND SURPLUS IN MARKETS WITH DIFFERENTIATED FOOD PRODUCTS 12

Andreas Böcker[1]

1. Introduction

Modern food industries offer consumers an ever-increasing range of products. For instance, during the period from 1985 to 1990 more than a thousand new products were introduced to the German market for milk products (Meyer, 1992, p. 72). To the consumer, the rising number of products means that there is a greater chance of selecting a product with the combination of properties that best fits his preferences. The closer the chosen brand gets to his ideal combination of properties, the higher his utility will be. However, he faces rising costs due to increasing search and information processing, both of which will lower his utility or surplus. Thus the question arises to what extent the consumer can actually benefit from enlarged product variety. A Hotelling type model of horizontal product differentiation is the basis for a simulation study in which answers to this question are sought by systematically varying consumer behavior and firm strategies of product positioning.

2. Theoretical background

2.1. Consumer search behavior

Two aspects of the complex field of consumer research are relevant for the type of simulation described above. First of all, consumers use different *decision rules* to choose a product. These rules, which are closely related to the kind of attributes from which utility is derived, can be divided into two groups, *non-compensating* and *compensating*. The non-compensating rule does not allow for the compensation of an attribute level which is valued lowly by another attribute which is valued highly by the consumer. Thus, the "failure" of a brand in terms of one property might lead to its exclusion from the consumers choice set. In grocery shopping this decision usually is employed when search qualities exist, which allow the consumer to evaluate a brand before purchasing it. In contrast, the overall impression of a product is considered when using a compensatory decision rule: highly valued attributes or attribute levels can compensate for a product property which is unsatisfactory. This should be a good approximation of human judgment of food

products. Since experience qualities play a major role in the evaluation of food products, usually no pre-purchase judgment is possible and the overall impression during consumption is most important. Thus, in the model it is reasonable to assume that consumers use the compensatory decision rule.

Secondly, human information processing is biased by the use of simplifying *heuristics*. In psychological and consumer research, three different heuristics are widely used to describe human information processing: anchoring, availability, and representativeness (Dawes, 1988). The latter describes the process of transferring personal experience from one field to another, ignoring additional information. Since the model developed here deals with one product class only, this heuristic will not be considered. *Anchoring*, in which early experience is overemphasized in decision making, and *availability*, in which, to the contrary, recent experience is overemphasized, are used and compared to an unbiased behavior, in which every unit of information is given the same weight.

2.2. Relating utility to product attributes: Address models of product differentiation

After having described the relevant features of consumer search behavior, a concept is needed with which it is possible to measure consumer surplus attributable to differences in product properties.

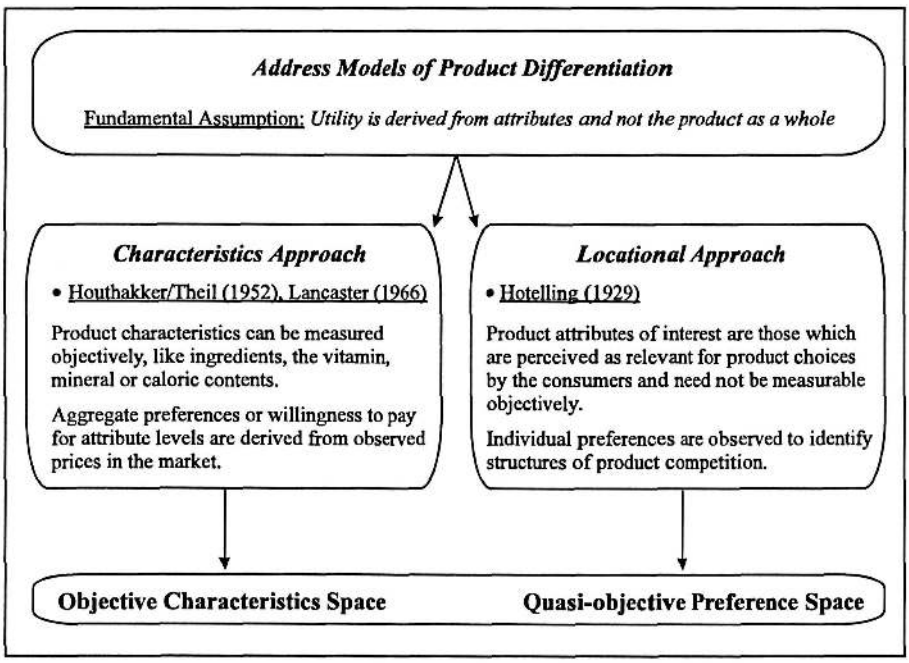


Figure 1: Address models of product differentiation

Address models of product differentiation provide a framework for measuring a surplus derived from the specific attribute levels of each product (Eaton and Lipsey, 1989; Waterson, 1989). In the terminology of this approach, an address is the position of a product in the relevant attribute or preference space, i.e., the coordinates of a product or brand are identical to its specific attribute levels. Within the address branch, there are two approaches, as shown in Figure 1. The characteristics models take a macro economic view of differentiated markets and the objective properties of the products within a group. A measure of preferences or willingness to pay for attribute levels is derived from the existing brand prices at an aggregate level without further investigation of consumers' tastes at the micro economic level.

As opposed to characteristics models, locational models first look at individual preferences and then relate existing and potential products to the consumers tastes in a space of perceived salient attributes. As a result, products *and* consumer segments receive addresses or perceived positions in a quasi-objective preference space. This approach is the basis for product positioning models and perceptual mapping techniques used in marketing research (Schmalensee and Thisse, 1988). Since individual preferences are the starting point for this approach, it is well-suited for merging with some aspects of individual search behavior. Thus, the remainder of section two is devoted to the basic assumptions and results of the Hotelling model concerning the impact of product differentiation on consumer surplus.

2.3. *The Hotelling model of locational competition*

To consider the evaluation of attributes within an economic model, the concept of consumer surplus is extended to contain the difference between the consumer's willingness to pay for a product and its price, on the one hand, and the disutility resulting from the consumption of a non-ideal brand, on the other hand. This disutility is an increasing function of the distance between the consumer's address (or ideal point) and the product's address (or position) in the preference space. The assumptions of the basic Hotelling model can be stated as follows:

(i) Two firms with identical cost functions (entry or fixed costs and variable costs equal zero) enter the market, and each offers one product.
(ii) The products differ by one attribute whose level can be varied continuously in the [0,1] interval. The two brands cannot have identical positions in this attribute space[2].
(iii) Prices are chosen before entry, so competition takes place in positions.
(iv) Consumer tastes are uniformly distributed along the attribute spectrum.
(v) Consumers buy one unit of the differentiated product. They choose the brand that maximizes their surplus according to the value function:

$$[1] \qquad U_{ij} = \max\left(RP_i - p_j - \alpha D_{ij}^{\eta} \right) \geq s_n ,$$

where: RP_i = reservation price (willingness to pay for ideal product) of consumer i,
p_j = price of product j,

D_{ij} = Euclidian distance between consumer i and product j,
α = parameter of tolerance,
η = parameter of preference intensity > 0,
s_n = surplus derived from consumption of outside or numeraire good.

While η defines the shape of the disutility function[3], α defines the maximum Euclidian di-stance to a product position which is just tolerated by a consumer, when η is given. In Hotelling's model, α and η are assumed to equal one so that the disutility caused by the consumption of a non ideal brand increases proportionally with its distance from the consumer's ideal point, while his willingness to pay decreases. If both products are offered at the same price, he clearly buys the one which is closer to his address in the preference space, as long as the surplus exceeds that of the outside good. Otherwise the consumer buys no product.

3. The simulation model

3.1. A market with two choice relevant product attributes

The market developed here differs from that of the Hotelling model in three ways. Firstly, the products entering the market differ in two attributes which the consumers view as equally important for the buying decision. Secondly, the relevant or salient attributes cannot be varied continuously as in the basic model. Instead, we assume that each attribute can be varied on nine discrete levels. This is done for two reasons:

(i) Consumers tend to perceive continuously variable product attributes in a discrete manner in order to simplify information processing. Nine is about the maximum number of levels a consumer can assign to an attribute in the perception process (Grunert, 1982, p. 55).
(ii) In case of a discrete variation programming effort and computing time for calculating the entry positions of the products are much less than they would be in the continuous case.

From this assumption a two-dimensional preference space evolves, with 81 possible brand positions which are identical to the ideal points of consumer segments (see Figure 3 below). At each such point the density is normalized to one so that the simulation model will be based on 81 consumers. Thirdly, consumers do not have complete knowledge of all existing and potentially new products. Since the relevant product attributes are both experience qualities, the consumers actually have to buy them to find out whether they are acceptable or not.

3.2. Consumer behavior: Sequential search and stopping rules

As in the basic model, product choice is deterministic, but the value function has changed slightly. The disutility is now a quadratic function of D_{ij}, as is assumed in most product differentiation studies of the Hotelling type:

$$[2]\ U_{ij} = \max\left(RP_i - p_j - \alpha D_{ij}^{\eta} \right) \geq s_n,$$

where: RP_i = consumer i's reservation price = 6 for all consumers,
p_j = price of product j = 1 for all products,
D_{ij} = Euclidian distance between consumer i and product j,
α = parameter of tolerance = 5/32,
η = parameter of preference intensity = 2,
s_n = surplus derived from consumption of outside or numeraire good.

The parameter α is chosen to guarantee that any consumer in the market will enjoy a surplus greater than or equal to zero when consuming the product in the market center ($z^1 = 5$, $z^2 = 5$).

3.2.1. Stopping rule

As a normative implication of search theory, consumers should stop searching when the expected costs of a search outweigh the expected surplus or utility gain. The following assumptions describe a sequential search for a consumer:

(i) The sequence of a search is determined by the sequential product entry, i.e., in each period a searching consumer tries the brand that has entered the market in that period.
(ii) The consumer views the experienced utility as a random draw from a normal distribution, the mean and variance of which are solely derived from the consumer's experience.
(iii) After deciding to stop, the consumer cannot begin searching again.
(iv) Recall takes place, which means that after stopping the consumer chooses the brand with the highest utility to him from all the products he has tried.
(v) There is no constant search cost for trying a product. Instead, the cost is expressed as the expected disutility resulting from trying a product of a lesser value to the consumer than the one most preferred so far. Thus, search costs crucially depend on the utility level already achieved.
(vi) The consumer immediately stops when he happens to try his ideal brand ($D_{ij} = 0$).

Discounting takes place over a limited time span.

The decision tree for a consumer is shown in Figure 2. Because recall is possible, an unsuccessful search means that the consumer must bear the disutility only in the period of the trial. Since $U_i(best)$ is known, the expected loss in surplus $E(U(-))$, i.e. the search cost in the following period, is:

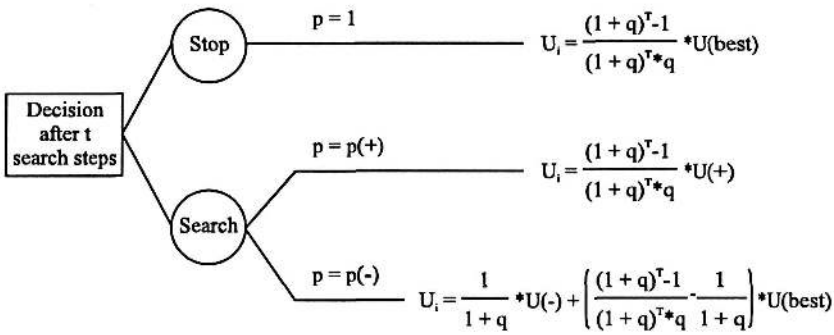
$$[3]\ E(U(-)) = (U(best) - U(-)) * (1 - p(+)) * 1/(1+q)$$

If the consumer is successful and finds a better product, he can enjoy his improved utility for all periods within his time horizon, so that the cumulated discounted gain in surplus $E(U(+))$ in the case of a successful search equals:

[4] $$E(U(+)) = p(+) * \sum_{t=1}^{T} ((U(+) - U(best)) * (1+q)^{-t}) = p(+) * \frac{(1+q)^T - 1}{(1+q)^T * q} * (U(+) - U(best))$$

The consumer will stop searching if the following condition holds:

[5] $$E(U(-)) > E(U(+))$$



p(+)	: Probability of a successful search (the new product is better than the best one so far)
p(-)	: Probability of an unsuccessful search (the new product is not better than the best one so far)
U_i	: Expected utility of consumer *i*
U_i(best)	: Utility level of most preferred brand after *t* serach periods
U_i(+)	: Expected utility of consumer *i* in case of a successful search
U_i(-)	: Expected utility of consumer *i* in case of an unsuccessful search
q	: Discounting rate
T	: Time horizon of consumers

Figure 2: Decision tree for a consumer after t search periods

3.2.2. Information processing

In order to make a decision to stop consumers must derive the values of *p(+)* and *p(-)* from a subjective probability function which is assumed to be a normal distribution. Three different kinds of information processing patterns are considered. They differ in the extent to which information about the last product which the consumer has tried enters into the decision making. All patterns have one element in common: consumers must search at least three times before they decide whether to stop or to continue searching. A search with a minimum of three products is necessary for a minimal level of accuracy in estimating the mean and to calculate the variance of the assumed normal distribution of utility values.

If consumers process information according to the *Realist* pattern, every single utility value experienced is equally weighted in the calculation of the mean and variance:

[6] $$E_{t+1}^{Real} = \sum_{s=1}^{t} U_s \Big/ t \qquad \text{for } t \geq 3,$$

$$[7]\ V_{t+1} = \sum_{s=1}^{t} (E_{t+1} - U_s)^2 \Big/ (t-1)$$

where: E_{t+1} = expected surplus from continuing a search,
V_{t+1} = variance assumed for next search step,
U_s = surplus in period s,
t = search periods so far.

When acting in accordance with the *Anchoring* heuristic, the consumer exhibits conservatism in the sense that his early experiences in the market or product group are overemphasized. The extent to which this happens depends on the *Anchoring factor* β:

$$[8]\ E_{t+1}^{Anchor} = \beta * E_t + (1-\beta) * \left(\frac{(t-1)}{t} * E_t + \frac{1}{t} * U_t \right) \quad \text{for } t \geq 3,$$

where: $0 < \beta < 1$, = *Anchoring factor,*
E_t = expected surplus in period *t-1*,
U_t = experienced surplus in period *t*.

In contrast to the Anchoring heuristic, the *Availability* heuristic stresses recent experiences. The extend depends on the *Availability factor* γ:

$$[9]\ E_{t+1}^{Available} = \gamma * U_t + (1-\gamma) * \left(\frac{(t-1)}{t} * E_t + \frac{1}{t} * U_t \right) \quad \text{for } t \geq 3,$$

where: $0 < \gamma < 1$, = *Availability factor,*
E_t = expected surplus in period *t-1*,
U_t = experienced surplus in period *t*.

The calculation of the variance for the two heuristics is somewhat difficult. While it seems reasonable for it to be biased, too, in what direction is not clear. Thus, we assume that it is biased by our use of the values of the expected surplus of each heuristic, E_{t+1}^{Anchor} and $E_{t+1}^{Available}$ (the mean of the assumed distribution), in its calculation.

3.3. Firm behavior: Strategies of product positioning

Firms offer one product and enter the market sequentially. Once introduced, a brand's characteristics may no longer be altered due to position specific sunk costs. All firms face identical cost functions and offer their products at the same price: ($p_j = p = 1$):

$$[10]\ C_j = f(Q_j) = C_{sunk} + C_v * Q_j,$$

where: C_j = total cost of firm j,
C_{sunk} = sunk cost of market entry = 1,
C_v = variable cost = 0,
Q_j = output of firm j.

The firms are fully informed about consumer preferences and their search status. The latter is quite important, because consumers who have stopped searching will not try another brand, even if it is their ideal one. Furthermore, producers are fully informed about the positions of established products, but they totally ignore possible future entries when making their own entry decision. Thus, the entry criterion of a particular positioning strategy is somewhat myopic, because it is only related to the period of entry. Two different strategies are taken into account. When firms enter according to the *revenue-maximizing* strategy (R-strategy) they choose the position for their product which maximizes revenue in the entry period. This leads to positioning patterns in which early entrants are partially imitated by their followers. When firms enter according to the *utility-maximizing* strategy (U-strategy) they choose the position for their product that maximizes the overall consumer surplus, given the positions of all products which have been previously introduced on the market. This leads to a fairly evenly distributed positioning pattern in which firms occupy niches.

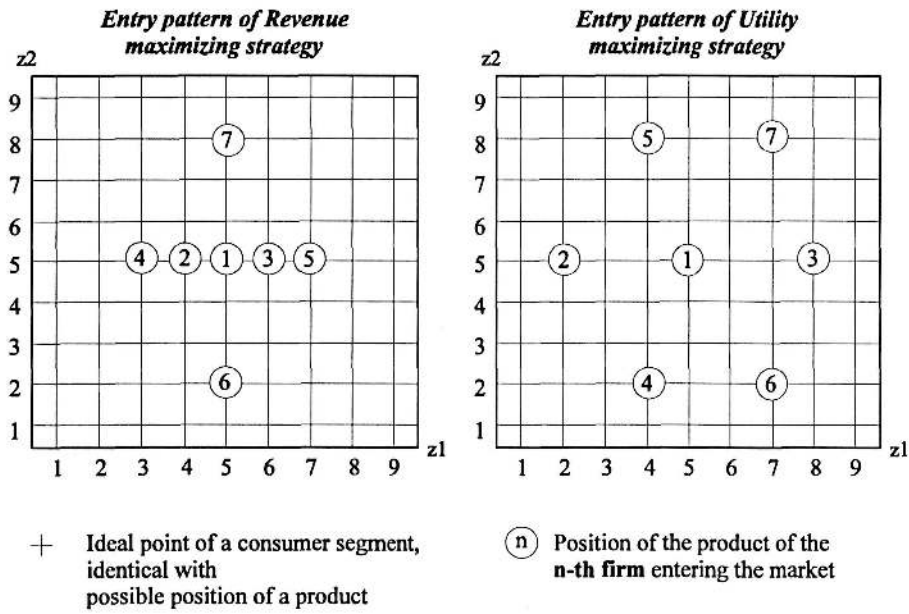


Figure 3: Entry patterns for different types of positioning strategies

The positioning of the first or pioneer brand is also of interest, because its success may deter entry of new products, although consumers would be better off if new products entered the market. In order to model such a pioneer effect, the position of the first entrant is varied. Five such positions are considered: $(z^1, z^2) = (5,5)$, (6,6), (7,7), (8,8), or (9,9), with the order resembling a ranking of decreasing pioneer success as its position gets farther away from the market center (Kardes et al., 1993).

The entry patterns of the products, i.e., the way in which positions in the preference space are occupied, depend on the firm strategy and the position of the pioneer brand. To illustrate the basic differences between the two strategies, Figure 3 depicts the entry patterns of the first seven brands when the pioneer brand has entered at the center of the market. The introduction of new products ends when the potential new entrant is unable to cover the cost of market entry during the same period ($C_{sunk} + C_v * Q_j > p * Q_j$). Since $p = 1$ and $C_{sunk} = 1$, this can only be so if $Q_j = 0$, i.e when all consumers have stopped searching.

3.4. Simulation design: Variation of parameters and factors

As model output, three dimensions relate to different conditions on the demand and the supply side:

(i) the achieved level of consumer surplus after entry of the last product,
(ii) the degree of search committed to by the consumers beyond the minimum of three levels,
(iii) the number of products entering the market.

The following factors are varied systematically, leading to 120 (= 3 * 2 * 5 * 2 * 2) simulations:

Information processing of consumers:	*Realist*	
	Anchoring	$\beta = 0,9$
	Availability	$\gamma = 0,9$
Positioning strategies:	*U-strategy* (utility maximizing) *R-strategy* (revenue maximizing)	
Position of first entrant:	(z^1, z^2) = (5,5), (6,6), (7,7), (8,8), or (9,9)	
Discount rate of consumers:	$q = 0,05$ or $0,01$	
Time horizon of consumers:	$T = 5$ or 10	

4. Results and implications for marketing

The results of the simulation study are not meant to be seen as predictions of actual choice behavior in real markets. For this purpose, too many aspects of consumer

choice and firm strategies are unaccounted for. Instead, results at this rather high level of abstraction should serve as examples of the output that one can obtain from this approach. Additionally, interpreting the results properly can provide general insight into markets in which experience plays a major role in product evaluation.

The influence of firm behavior refers to the positioning strategy and the position of the first entrant. As shown in Table 1, a firms' ability to both recognize consumer preferences design products which increase consumer surplus in all cases. Regardless of the circumstances, the U-strategy outperforms the R-strategy: it produces a higher surplus level despite fewer products and a lower level of search intensity. In marketing terms, one could refer to this as an incentive for target marketing (Kotler, 1988, p. 279). The worthiness of such a strategy depends on the actual relation between the additional cost for market research which is necessary for such a strategy, and the additional revenues produced by it. However, for the whole product class (or a more narrowly defined group) a gain in consumer surplus or satisfaction will strengthen its strategic position with respect to other product classes.

Table 1: Simulation results for different conditions on demand and supply side

		Utility-maximizing Strategy			Revenue-maximizing Strategy		
Variation of factors	n[1]	Surplus	Products tried[2]	Product entries	Surplus	Products tried[2]	Product entries
P1 = (5.5)	12	320.58	13.67	4.92	288.25	12.67	4.33
P1 = (6.6)	12	346.85	15.75	4.67	306.20	16.83	5.83
P1 = (7.7)	12	356.11	17.75	4.67	309.86	23.67	5.58
P1 = (8.8)	12	350.36	24.42	5.08	324.97	45.17	6.92
P1 = (9.9)	12	342.24	23.08	4.92	324.31	73.00	7.00
q = 0.05; T = 5	15	339.27	12.47	4.47	304.41	23.40	5.20
q = 0.05; T = 10	15	340.31	14.67	4.67	306.12	25.80	5.40
q = 0.01; T = 5	15	345.37	22.53	5.07	312.42	39.07	5.93
q = 0.01; T = 10	15	347.43	26.07	5.20	315.76	48.80	7.20
Realist	20	342.86	13.40	4.75	304.86	20.05	5.50
Anchoring	20	339.12	10.00	5.00	301.16	16.20	5.90
Availability	20	347.45	33.40	4.80	323.00	66.55	6.40
Overall	60	343.23	18.93	4.85	310.72	43.27	5.93

[1] n = number of simulation runs for each positioning strategy;

[2] total number of products tried by consumers who are still searching after trying the first three products

Consumer willingness to pay for a product depends on both the absolute utility level within a particular class and surplus relative to other groups. Additionally, a type of U-strategy would be probably best supported by informative advertising that tells the consumers which attribute levels they can expect when trying a new product[4].

The results concerning the position of the first entrant are a bit surprising. In both strategies, the surplus and the duration of search are lowest when the pioneer brand enters at the market center. Generally speaking, as the pioneer's position moves to the center of tastes or as it becomes more successful, a greater share of the consumers quits searching sooner and stays with the pioneer brand, enjoying a more or less satisfactory surplus level.

On the demand side, the variation of the discount rate and the time horizon does not render any surprising results. With decreasing q and increasing T the level of searching, the number of entries, and eventually, the surplus rise. This is due to the following relations:

(i) A decrease in q primarily lowers the weight given to expected disutility from an unsuccessful search, thus increasing the incentives to continue searching. In the aggregate, this causes more products to enter, and the surplus level to rise.

(ii) An increase in T primarily raises the expected gain from a successful search, also increasing the incentives to continue the search.

There is an interesting result concerning the kind of information processing: in markets where firms apply the U-strategy, there are no great differences between the three types of consumers with respect to the level of surplus. Relating this result to marketing matters, one could conjecture that consumers can benefit almost equally from such a strategy. Thus, a broad base of satisfied consumers is secured, and the competitive position of such a market is once again strengthened. This is not the case for markets in which an R-strategy is predominant.

Finally, by looking at Table 2 one can see that both in U-strategy markets and in R-strategy markets, the level of surplus only increases up to a certain degree of product differentiation, which is indicated here by the number of entries. Beyond this point, i.e., five products for the U-strategy and seven products for the R-strategy, the surplus stagnates or decreases. Apparently, if the consumer wants to take advantage of the growing product variety, he has to increase his search efforts substantially, otherwise the level of surplus will fall. But in low-involvement categories, to which many food products belong, consumers are not willing to invest in extended searches. So, especially in those cases, in-depth product selection will probably leave the consumer fairly very dissatisfied such that firms can only respond by reducing the number of brands they offer[5].

Table 2: Degree of product differentiation and level of consumer surplus

	Utility-maximizing Strategy			Revenue-maximizing Strategy		
Number of entries	Surplus	Products tried[1]	Size of group	Surplus	Products tried[1]	Size of group
3				281.25	0.00	2
4	335.05	10.25	16	290.74	10.71	14
5	342.50	22.38	39	300.56	10.86	7
6	341.67	22.00	3	313.25	32.00	11
7	321.72	16.50	2	323.49	66.50	21
>7				320.94	110.50	5

[1] Total number of products tried by consumers who are still searching after trying the first three products.

Two concluding remarks can be made about markets with predominately experience qualities. Firstly, one can say that surplus generally depends more on firm behavior than on the extent of information searching and processing done by the consumers. Secondly, an intermediate degree of product differentiation appears to be optimal for the consumers.

Notes

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[2] Hotelling's example for such a product space was the range of different ciders from the extremely sour to the extremely sweet ones. Other examples would be the peatiness of whisky or the sweetness of bread.

[3] If $\eta = 1$, utility decreases linearly with the Euclidian distance between consumer and product positions. If $\eta > 1$, it decreases at an increasing rate, and if $\eta < 1$ it decreases at a decreasing rate.

[4] A good example of informative advertising is the little brochure with which the *Coberco Kaas* company promoted the launch of the *Cantenaar* cheese brand on the German market. It contained information about the full, intense flavor, the reduced fat and salt contents, and the granular texture of the cheese. Also, a few recipes were included to encourage the use of the brand for different purposes.

[5] In the late 1980's, e.g., the Campbell Soup company greatly reduced its soup selection after marketing research had provided evidence that most consumers just gave up and quit searching after 45 seconds (see Blackwell et al., 1993, p. 524).

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TESTING FOR THE INTERTEMPORAL SEPARABILITY HYPOTHESIS ON ITALIAN FOOD DEMAND 13

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Franco Rosa[2]

1. Introduction [3]

During the last forty years, consumer demand analysis has evolved toward a system-wide approach. Since Working's work (1943) on Engel curves, the "demand-system" models which have been mainly used by economists are the Linear Expenditure System proposed by Stone (1954) (e.g., Andrikopoulos, Brox and Carvahlo, 1984; Andrikopoulos, Brox and Georgakopoulos, 1987; Kennes, 1983; Michalek and Keyzer, 1992) and the Almost Ideal Demand System proposed by Deaton and Muellbauer (1980) (e.g., Blanciforti and Green, 1983; Burton and Young,1992; Chen and Veeman,1991; Chesher and Rees, 1987; Dono, 1991; Dono and Thompson, 1994; Fulponi, 1989; Karagiannis and Velentzas, 1995; Mergos and Donatos, 1989; Michalek and Keyzer, 1992; Molina, 1994; Moschini and Meilke, 1989; Pierani and Rizzi, 1991; Ray, 1980; Reynold and Goddard, 1991).

These models generally assume the hypothesis of intertemporal separability, allowing current demands to be formulated in function of contemporaneous exogenous variables (i.e. prices and expenditure), but not in terms of lagged and lead regressors[4]. By the way, despite extensive empirical evidence, we question whether the intertemporal separability hypothesis is justified in the analysis of food demand. The purpose of this paper is to test the intertemporal separability hypothesis on food demand in Italy for the period 1960-1993. For this purpose, the model to be estimated is the "simple nonadditive preferences" (SNAP) structure for intertemporal preferences proposed by Browning (1991), which generated a demand system dependent on prices lagged by and lead by one period, as well as, current prices. The econometric estimation of the SNAP demand system gives empirical evidence for whether or not Italian food consumers reject the intertemporal separability hypothesis, or likely; whether or not consumers considered lead and lagged exogenous variables to be relevant for their purchasing decisions.

The paper is developed as follows: in Section 2, the theoretical background is given for the SNAP demand system which consisted of: i) discussing the optimization problem, ii) developing the profit function and the Frish demand; iii) using these two functions to frame the dual PIGLOG cost function; iv) to derive the SNAP demand system from the PIGLOG cost function. In Section 3, the data sources and the estimation method are described; in Section 4, the empirical results are discussed; in Section 5, the most relevant conclusions about consumer behavior are presented.

2. Optimization, Frish demand and profit functions

The analysis begins with the definition of the intratemporal model of constrained consumer optimization using the utility function and the budget constraint:

[1] $Max \quad u = u(q) \quad subject \quad to \quad pq = y$

where u(q) indicates the utility function, p and q represent the vectors of prices and quantities, and y is the total expenditure function. Assuming: i) the utility function increases monotonically and is strictly concave and twice differentiable; and ii) the internal optimal solutions is derived from first and second order conditions, we define:

[2] $\Delta u(q) = \lambda p = p / r$

where Δ represents the gradient of the utility function; λ is the lagrangian multiplier which indicates the magnitude of change in the objective function due to a given change in the budget constraint or the marginal utility of food expenditure, and the reciprocal quantity r is the marginal cost of utility, or alternatively, a price dimension of the utility.

The utility function in equation [2] can be inverted to give:

[3] $q = f(p / r)$

This function is monotonically decreasing and zero degree homogeneous in r and p (vectors) with symmetric derivatives and downward slopes. Browning (1982) named the equation [3] the Frish demand or constant marginal utility demand. The conceptual idea is that the consumers are compensated financially for price changes until the price of the utility returns to its original value. The Frish demand equation is the dual representation of the individual preferences (a function of prices and some measure of welfare), that is the profit function in consumption leads to a demand function. Following this rationale, a consumer can maximize his profit and utility using goods as inputs. This means that the assumed profit level is the maximum obtainable by selling utility at the hypothetical price r (the inverse of the marginal utility of income) given the utility function and the prices of goods. Hence, for the above utility function the following profit function is given:

[4] $\Pi(p,r) = \underset{u,q}{Max}\{ru - pq\} \quad given \quad u = u(q)$

We could assume that this function is convex, homogeneity and linear in r and p, and increasing in r and decreasing in p. Alternatively, profit can be expressed as a function of the expenditure as follows:

[5] $\Pi(p,r) = \underset{u}{Max}\{ru - c(p,u)$

With the differentiation of equation [5] respect to p, we derive the following Frish demand equation:

[6] $- \partial\Pi(p,r) / \partial p_i = q_i = f_i(p,r)$ for all i

Hence [5] and [6] represent respectively the profit function and the Frish demand for the intratemporal demand model.

2.1. From Intratemporal to Intertemporal Demand: the SNAP Model

Both, the Frish demand and the profit function allows us to elaborate the intertemporal model from the intratemporal one. We assume: i) a finite time horizon T with t periods; and ii) the intratemporal utility functions are monotonically increasing, strictly concave, twice differentiable (to satisfy the first and second-order conditions for optimization) and identical except for a coefficient of proportionality β_t which represents the rate of intertemporal preference. Assuming that the intertemporal preferences are additive and separable, the utility function of the rational consumer is given by:

[7] $u(q^1 \ldots q^T) = \sum_{t=1}^{T} u^t(q^t)\beta_t$

where $u^t(q^t)$ is the intratemporal utility function for period t and q^t is the vector of all goods in t, so that $q^t = (q_1^t, \ldots . q_n^t)$. Assuming the conditions of perfect capital market, the consumer budget constraint is:

[8] $\sum_{t=1}^{T} \hat{p}^t q^t = A$

where A is the consumer's total wealth; $\hat{p}^t = \delta(t,0)\, p^t$, where p^t represents the vector of current prices in period t, $\delta(t,0)$ is the discounting rate factor, and $\hat{p}^t$ is the vector of discounted prices, that will be transformed into the utility function to obtain:

[9] $\nabla u^t(q^t) = \lambda \hat{p}^t$

The first order conditions in equation [9] are likely to be the ones indicated in [2] and allow us to frame the Frish demand function assuming the intertemporal allocation of wealth.

$$[10]\ q^t = \left[q^t \hat{p}^t, r \right]$$

This equation assumes the marginal utility of the (discounted) wealth is fixed; this condition is required to assess the consumer's rational behavior through time. Alternatively, it can be said that the past affects the present, and the rational consumer considers the future prices in making decisions. Deaton and Muellbauer (1980) state that this approach is suitable for empirical investigation once the intertemporal separability hypothesis has been assumed. With additive separability, the dual profit function properly represents the consumer's preferences based on the same assumptions about the additive structure of the direct utility function. This allows to assume that additive utility corresponds with the additive profit function, and the overall profit function is the sum of individual profit functions when viewed as subutility functions. Hence the overall profit function is defined as the maximum profit the consumer can achieve by selling his utility at the hypothetical price r (the inverse of the marginal utility of income), and given the utility function and food prices:

$$[11]\ \pi(\hat{p}^1 \ldots \hat{p}^T, r) = \underset{q}{Max} \left(r \sum_{t=1}^{T} \beta_t q^t(p^t) - \sum_{t=1}^{T} \hat{p}^t q^t \right) = \sum_{t=1}^{T} \pi^t(\hat{p}^t, r)$$

Since intertemporal additivity is a very extended assumption, we question whether it is justifiable in the consumer behavior model. The answer requires the postulation of a non-separable preference structure, which allows for testing the separability hypothesis; this argument is developped in the next session.

2.2. *The SNAP model*

The empirical model to estimate the intertemporal preferences was elaborated by Browning (1991) by nesting the additivity over time and defining the SNAP structure by specifying the following intertemporal profit function:

$$[12]\ \pi(\hat{p}^1 \ldots \hat{p}^T, r) = -\sum_{t=1}^{T-1} \Phi^t(\hat{p}^1 \ldots \hat{p}^{t+1}, r)$$

All $\Phi^t(\cdot)$ represent the loss functions, concave and linear homogeneous in $\hat{p}^t \ldots, \hat{p}^{t+1}, r$ and increasing for $.\hat{p}^t \ldots, \hat{p}^{t+1}$. From the profit equation [12] the Frish demand is derived with the Hotelling's theorem:

$$[13]\ q^t = \nabla_t \Phi^{t-1}(\hat{p}^{t-1}, \hat{p}^t, r) + \nabla_t \Phi^t(\hat{p}^t, \hat{p}^{t+1}, r)$$

where ∇_t indicates the gradient of the profit function with respect to the price at time t.

The above equation permits to introduce the condition of uncertainty in consumer modeling, assuming consumer decisions are affected by two sets of information: the first ones represented by historical prices; and the second ones represented by the

$$[18]\ \Phi^{t-1}(p^{t-1}, p^t, r_t) = -\left\{ log\left[\frac{r_t}{b(p^t)}\right] - log\, a(p^t) - 1 + log\, d(p^{t-1}) \right\} \frac{r_t}{b(p^t)}$$

where d(•) is a zero degree homogeneous function.
The Marshallian demand with the SNAP structure is derived by substituting the loss functions [18] into equation [14]. That demand depends on the current price of utility. However, such a function is not observable, and can not be estimated. Thus, a solution is to express it as a function of the budget identity in t to obtain:

$$[19]\ y_t = \frac{r_t}{b(p^t)}$$

The price estimations are formulated as follows:

$$[20]\ log\, a(p^t) = \alpha_o + \sum_k \alpha_k\, log\, p_{kt} + \tfrac{1}{2} \sum_k \sum_j \gamma_{kj}\, log\, p_{kt}\, log\, p_{jt}$$

$$[21]\ log\, b(p^t) = \sum_k \beta_k\, log\, p_{kt}$$

$$[22]\ log\, d(p^t) = \sum_k \theta_k\, log\, p_{kt}$$

After readjusting the terms, the budget share functions for the SNAP demand system are:

$$[23]\ w_{it} = \alpha_i + \sum_j \gamma_{ij}\, log\, p_{jt} + \beta_i\, log\left[\frac{y_t}{a(p^t)}\right] + \beta_i \sum_k \theta_k\, log\, p_{k,t-1} + \delta_i \left[\frac{b(p^t)}{b(p^{t+1})}\right]$$

for all i

This equation is similar to the AIDS model of Deaton and Muelbauer except for the last two terms. It contains all relevant information about consumer demand framed into the SNAP model. Both, SNAP and AIDS satisfy the axioms of choice and perfectly aggregation in consumption. The first term of equation [23], α_i is a constant; the second, $\sum_j \gamma_{ij}\, log\, p_{jt}$ is the price effect of the goods considered; the third, $\beta_i\, log\,(y_t / a(p^t))$ is the real expenditure; the other two represent the effects of past and future prices. Here following are listed the restrictions imposed on the SNAP model:

[24] • Adding-up: $\sum_i \alpha_i = 1$ and $\sum_i \gamma_{ij} = \sum_i \beta_i = \sum_k \theta_k = 0$ for all i

[25] • Current homogeneity: $\sum_j \gamma_{ij} = 0$ for all i

[26] • Lagged homogeneity: $\sum_j \theta_j = 0$

prospects about future prices. In this inseparable preference model, the uncertainty determine several modifications in the Frish demand function, respect the demand model under certainty. These differences can be explained by considering that in the first case, the agent has more information about the prospects for future prices, which are incorporated and inverted in the marginal utility of income and modify it. Under uncertainty, the demand depends on the current prices of goods as well as the price of utility that changes over time. Thus if the Frish demand functions of the SNAP structure are given by equation [13], under uncertainty the equation is formulated in the following way:

$$[14]\ q^t = \nabla_t \Phi^{t-1}(\hat{p}^{t-1}, \hat{p}^t, r_t) + \nabla_t \Phi^t(\hat{p}^t, \hat{p}^{t+1}, r_t)$$

Assuming a nonadditive preference structure, consumer decisions depended on prices one-period lag, one-period lead and current prices. Therefore, for the SNAP structure, a good can be a substitute or complement for itself in the periods immediately before and after the current one; which are defined as the autosubstitute (or autoindependent) and autocomplementary conditions, respectively. To structure the Marshallian demand system, while maintaining intertemporal dependence from the SNAP structure, it is assumed that the most suitable functional form for demand, depends on the available data. The type of aggregation requires some restrictions on the structure of individual preferences. Browning (1991) suggests deriving the demand equation from a subfamily of the PIGLOG cost function under appropriate restrictions for an individual preference structure. (see also Muellbauer, 1975, 1976). Then the PIGLOG cost function is formulated as follows:

$$[15]\ \log c(p^t, u) = \log a(p^t) + b(p^t)u$$

with: a (•) is linear homogeneous and b(•), is zero-degree homogeneous. If we define the profit function in term of the maximum profit, the consumer is allowed to obtain when he sells his utility at the hypothetical price r that corresponds with the inverse of the marginal utility of income, and with the utility function and the prices of goods for a generic utility function u = u(q), we have the following function:

$$[16]\ Max_{u,q}\left\{ru - pq;\ for\ \ u = u(q)\right\}$$

this is a convex, linear homogeneous in (r, p) increasing for r and decreasing for p. With the substitution of the expenditure function [5] in the above function we obtain:

$$[17]\ \pi(p^t, r_t) = r_t u - c(p^t, u) = \left[log\left(\frac{r_t}{b(p^t)}\right) - log\, a(p^t) - 1\right]\frac{r_t}{b(p^t)}$$

by incorporating the lagged prices, the intratemporal loss function becomes:

[27] • Intratemporal symmetry: $\gamma_{ij} = \gamma_{ji}$ for all $i \neq j$

[28] • Intertemporal symmetry: $\theta_i = -\delta_i = 0$ for all i

[29] • Myopic behaviour: $\delta_i = 0$

A requested condition is the negativity of the Hicksian price matrix effects. This property can not be imposed with a restriction on the parameters of the model. However it is possible to test it, by computing the signs of the Hicksian own-price elasticities: a presence of negative sign means that the hypothesis is satisfied.

The interpretation of SNAP estimations, requires to make clear the meaning of the elasticities. By setting: $w_{it-1} = w_{it} = w_{it+1}$ and $b(p^{t-1}) = b(p^t) = b(p^{t+1})$ there are only insignificant changes in the estimation of elasticities, but it makes possible to derive the elasticities for the intertemporal model:

[30] • Non current Marshallian prices $e^{y}_{iit-1} = e^{y}_{iit+1} = \dfrac{\beta_i \Theta_i}{w_{it}}$ for all i

[31] • Expenditures: $e_{it} = 1 + \dfrac{\beta_i}{w_{it}}$ for all i

3. Data source and estimation

Italian annual time series data for food expenditures for the period 1960 to 1993 were collected from the National Statistical Office. Data for current and constant expenditures were available for seven categories of food: bread and cereals; meat; fish; milk and eggs; oil and fats; vegetable and fruits and other foods. The evolution over time for the share of each in consumer's budget and the annual average rates for the total sample period and for several subperiods were presented in the first part of the empirical analysis. Total food expenditures declined in the period studied from 36 to 17% (see Table 1) at an average annual rate of 2% for subperiod 1960 to 1974, and accelerated to 3-4% in the second subperiod 1975-93 due to social, demographic and some dramatic economic event like the consequences of the first and second oil shock.

The budget composition suggested that the total expenditures for food declined over the past three decades, and modified the composition of the food bundle; expenditures on bread and other foods declined by more than 5% and on oil by another 3.5% while expenditure on vegetables and fruits, milk and dairy products, meat and fish increased. By observing the mean values we saw that the consumption of meat and vegetable and fruits made up of the greatest portions of total expenditures: respectively 32.56 and 22.96 %. In contrast, the share for fish was the smallest with 4.8%. The rate of inflation suggested that fish and vegetables and fruits had the highest average values with 9.98% and 9.5% respectively; the group

"other food" has the smallest with 7.02%. The annual inflation rate changed consistently throughout the subperiods: the decade 1975-85 saw the worst inflation due to the oil shocks and their destabilizing consequences for food prices in international as well as domestic markets.

For the overall period, the mean values for the all products fluctuated in the range between 7 and 10%. Price fluctuations were important economic signals for consumer decisions: in time of higher inflation periods the consumer spent more because they anticipate the declines in future purchasing power and higher uncertainty. Thus, we supposed that in this situation expected future prices affected consumer decisions more than historical or current prices. Due to these considerations, in the econometric estimation it was added an additive error term to equation [23], to capture the effects generated by: i) changes in consumer habits, ii) measurement errors in the dependent variables; and iii) effects caused by missing variables.

Table 1: Descriptive analysis

Budget shares (%)	1960	1965	1970	1975	1980	1985	1990	1993	Mean
Bread and Cereals	19.02	15.67	13.04	12.84	12.38	12.41	12.89	13.68	15.57
Meat	27.75	29.32	34.35	35.12	34.79	32.98	31.36	29.74	32.56
Fish	4.10	4.30	3.92	3.82	4.47	5.46	6.81	6.77	4.80
Milk and Eggs	11.01	10.34	10.75	10.33	12.09	13.34	13.86	15.22	12.03
Oil and Fats	7.48	7.45	6.22	7.73	4.59	4.58	4.07	3.99	5.73
Vegetables and Fruits	18.01	23.16	23.38	22.33	24.31	24.04	23.92	23.31	22.96
Other Foods	12.59	9.73	8.32	7.80	7.32	7.15	7.04	7.25	8.32
Total Food/ Total Consumption	36.03	34.86	32.62	29.94	26.97	23.66	20.52	16.98	28.27

Rates of Inflation	1961-67	1968-73	1974-79	1980-85	1986-93	1961-93
Bread and Cereals	3.63	3.91	16.91	15.37	5.73	8.74
Meat	3.75	6.55	14.49	12.82	4.67	8.08
Fish	4.71	7.31	18.80	14.90	6.31	9.98
Milk and Eggs	6.50	5.36	18.86	12.41	4.75	9.19
Oil and Fats	2.25	3.59	15.69	11.38	3.71	6.95
Vegetables and Fruits	6.74	6.41	20.43	11.97	4.19	9.50
Other foods	0.84	2.77	18.50	10.99	4.02	7.02

Thus the budget share analysis was run with the following equation:

$$[32]\ w_{it} = \alpha_i + \sum_j \gamma_{ij} \log p_{jt} + \beta_i \log\left[\frac{y_t}{a(p^t)}\right] + \beta_i \sum_k \theta_k \log p_{k,t-1} + \delta_i \left[\frac{b(p^t)}{b(p^{t+1})}\right] + u_{it}$$

for all i

The Stone price index for $a(p^t)$ used for estimation was:

$$[33]\ \log a(p^t) = \log P^*,t = \sum_j w_j \log p_{jt}$$

The assumptions with respect to the error term were the following:

$$[34]\ E(u_{it}, u_{js}) = \left\langle \begin{array}{ll} \delta_{ts}\sigma_{ij} & t=s,\quad i,j=1..n \\ 0, & t\neq s,\quad s=1...T \end{array} \right|$$

where δ_{ts} indicates the Kroneker's delta (δ_{ts} = 1 if t=s, and 0 otherwise). Therefore, the error term is assumed to have an expected value of zero, and be serially uncorrelated, with a contemporaneous variance-covariance matrix with elements σ_{ij}.

The adding-up restrictions are $\sum_i u_{it} = 0$ for all t, the covariance matrix is singular and the likelihood function undefined. The procedure followed in this study, is to drop one of the equations ("other foods" was selected because the group is not a well identified aggregation, for that the effects on the consumer were less undefined), to estimate the remaining equations in the system and to calculate the parameters of the omitted equation using the additivity conditions.

We used for the econometric estimation of the SNAP model [32] a non-linear three-stage least squares procedure with current and lagged (log) prices, a current and lagged real expenditures and the time trend allowing as instruments to estimate the unrestricted SNAP model. Three specification tests were used: the first tested the individual first-order autocorrelation (Breusch-Godfrey test, 1981 for simultaneous models). It is a Lagrangian multiplier having, under the null hypothesis, a standard normal distribution. The joint autocorrelation was tested with the Harvey (1982) test, distributed as a χ^2 (n) with n = (7-1), is the number of estimated equations for the six food groups. The third specification test regarded the dynamic heteroschedasticity or ARCH error; it was used the Engle test (1982), which also had a χ^2 (1) distribution. These specification tests were run to prove that the error terms was a stochastic "white noise" process, namely, the model estimation satisfied the "a priori assumptions". The theoretical hypotheses were also tested using both: the Wald and "corrected Wald test" reported in Table 3. In accordance with Mauleon (1984), the corrected Wald test was: CW = (1-n/T) (1-k/T), where n was

the number of equations in the system, and k the average number of parameters in a single equation and T is the sample size.

4. Results and comments

The specification test for the unrestricted SNAP model reported in Table 2 suggests that neither the autocorrelation (individual and joint), nor the dynamic heteroschedasticity are significant at the 5% level in any of the estimated equations. With respect to the theoretical hypothesis, these tests indicate that the SNAP demand system also satisfies the econometric conditions to give reliable economic results.

Table 2: Specification tests for the unrestricted SNAP model

	Breusch-Godfrey	Harvey	Engle
Bread and cereals	0.202		0.721
Meat	1.468		0.234
Fish	1.951		0.009
Milk and eggs	1.257	16.37	0.299
Oils and fats	0.356		1.102
Vegetables and fruit	0.106		0.123

Critical values: standard normal at 5% : 1.96; $\chi^2(1)_{0.05} = 3.84$; $\chi^2(6)_{0.05} = 12.59$

Table 3: Hypothese tests

	Wald	Corrected Wald
Current homogeneity (6 d.f.)	26.29*	13.93*
Lagged homogeneity (1 d.f.)	12.63*	6.69*
Homogeneity (7 d.f.)	45.84*	24.29*
Intratemporal symmetry (21 d.f.)	269.38*	142.77*
Intertemporal symmetry (6 d.f.)	52.02*	27.57*
Symmetry (27 d.f.)	598.01*	316.94*
Intertemporal separability (6 d.f.)	33.70*	17.86*
Myopic behaviour (6 d.f.)	110.51*	58.57*

* Rejected hypotheses at the 5%. Critical values: $\chi^2(1)_{0.05} = 3.84$; $\chi^2(6)_{0.05} = 12.59$
$\chi^2(7)_{0.05} = 14.06$; $\chi^2(21)_{0.05} = 32.67$, $\chi^2(27)_{0.05} = 40.11$

In Table 3, the results of the Wald and Corrected Wald tests are reported to check for evidence confirming the theoretical hypotheses. All theoretical conditions (current and lagged homogeneity and intratemporal and intertemporal symmetry) are rejected at the 5% level. These results are similar to those described in other analyses of food demand in Western Country (i.e., Blanciforti and Green, 1983; Dono and Thompson, 1994; Fulponi, 1989; Mergos and Donatos, 1989; Molina, 1994).

The most relevant conclusion is that intertemporal separability must be rejected for Italian food demand". Likewise, the consumers are able to model their preferences for foods, using a set of information including current and one period lead and lag prices.

The myopic behavior is also rejected suggesting that expectations about changes in price for one period in the future can not be set to zero or in other words, current prices, the prices of one period past, and the expectations for prices one period into future are taken into account for a large number of food groups. In other words, consumer behavior is driven by changes in historical and future prices instead of only historical prices. This effect is captured by the model. In fact changes in future prices will affect real income and the utility of budget expectations (see Table 3). These results allow us to state that the model is better able to capture consumer reactions to price changes respect other traditional demand models. The estimated parameters and elasticities of the SNAP model reported in Table 4 for the budget share equation show that the 70% of the parameters are statistically significant at the 5% level. The comments about the results are: most of the price parameters for the seven groups of foods are statistically relevant at 5% level; only milk seems to be quite independent from other food prices. The budget share of a given food is always directly related to its price and this relation is always significant and inversely related to most of the other foods with exceptions of meat with vegetables and fruits, milk with fish, bread and cereals with fish and vegetables and fruits with bread and cereals. Specifically, the expenditure coefficients are significant for all equations, and the signs are negative with the exception of meat and vegetables and fruits which are classified as superior foods while three foods groups namely, bread and cereals, fish, milk and eggs, oil and fats and other foods are absolute necessities. Considering the non-contemporaneous Marshallian own-price effects (e_{ii}) the individual significance of the products $\beta\theta$ is confirmed. Bread and cereals, other foods and oil and fats exhibited a significant auto effect, with the first two groups of goods classified as autosubstitutable and oil and fats being autocomplementary; for the remaining groups there was evidence of autoindependency.

Table 4: Estimation of parameters and elasticities for the budget share equation

Cathegories	a_i	g_{i1}	g_{i2}	g_{i3}	g_{i4}	g_{i5}	g_{i6}	g_{i7}	b_i	q_i	d_i	b_iq_i	e_i	e_{ii}
Bread/cereals	1.524	0.086	-0.039	0.025	-0.023	-0.004	-0.025	-0.016	-0.121	0.295	0.004	-0.035	0.107	-0.264
	(12)*	(7.9)*	(-4.2)*	(2.6)*	(-3.6)*	(-1)	(-2.7)*	(-2.2)*	(-11)*	(4.5)*	(0.1)	(-4.2)*	(1.3)	(4.2)*
Meat	-0.635	-0.189	0.395	-0.114	-0.001	-0.021	0.024	-0.086	0.129	-0.095	-0.544	-0.012	1.398	-0.037
	(-1.4)	(-5.6)*	(9.8)*	(-2.9)*	(-0.03)	(-1.2)	(0.6)	(-2.5)*	(3.8)*	(-1.3)	(-3)*	(-1.2)	(13)*	(-1.2)
Fish	0.152	0.044	-0.086	0.091	0.008	-0.008	-0.056	0.004	-0.022	-0.141	0.162	0.003	0.533	0.066
	(1.7)	(6.4)*	(-9.8)*	(11)*	(1.2)	(-2.4)*	(-7.1)*	(0.5)	(-3.1)*	(-2.2)*	(4.2)*	(1.9)	(3.5)*	(1.9)
Milk and eggs	0.390	-0.027	-0.048	0.050	0.073	-0.022	-0.040	0.024	-0.043	-0.128	0.242	0.005	0.641	0.046
	(1.3)	(-1.3)	(-1.9)	(2.1)*	(3.5)*	(-2)*	(-1.7)	(1.1)	(-2)*	(-2.5)*	(2.1)*	(1.5)	(3.6)*	(1.5)
Oils and fats	0.773	-0.076	0.043	0.026	-0.019	0.077	0.003	-0.050	-0.049	-0.079	-0.155	0.004	0.140	0.068
	(5.1)*	(-5.1)*	(2.3)*	(2.4)*	(-2)*	(14)*	(0.3)	(-5.1)*	(-4.1)*	(-2.6)*	(-2.7)*	(2.2)*	(0.6)	(2.2)*
Fruit/Vegetables	-1.537	0.148	-0.192	-0.116	-0.026	-0.013	0.138	0.042	0.150	-0.017	0.034	-0.002	1.656	-0.011
	(-4.7)*	(5.5)*	(-5.8)*	(-4.3)*	(-1.1)	(-1.1)	(6.9)*	(1.8)	(5.3)*	(-0.3)	(0.4)	(-0.3)	(13)*	(-0.3)
Other food	0.332	0.014	-0.071	0.036	-0.012	-0.006	-0.045	0.082	-0.044	0.166	0.256	-0.007	0.462	-0.089
	(2.1)*	(1.2)	(-5.3)*	(3.9)*	(-1.5)	(-1.3)	(-4.4)*	(9.5)*	(-4.3)*	(3.5)*	(4)*	(-2.4)*	(3.7)*	(-2.4)*

* Rejected non-individual significance at the 5%, t-rates at the 5%: 1.96.

5. Conclusions

In this paper we elaborated the framework for the intertemporal structure of food demand in Italy for the period 1960-93 and verified its statistical properties with the estimation of the SNAP demand system. By maintaining temporal dependency, this model allowed us to test the intertemporal separability hypothesis. The main findings were that time separability is resoundly rejected, because the contemporaneous functions for food demand in Italy depended on current price and prices lagged and lead by one period. Evidence of non separability over time was shown for bread and cereals, oil and fats and "other food" groups, whereas for the remaining food categories, the autoindependent condition is accepted. Homogeneity (current and lagged), symmetry (intratemporal and intertemporal) and myopic behavior were also rejected at the 5% level. Finally, the expenditure elasticities signalled that bread and cereals, fish, milk and eggs, oil and fats, and other food were necessities, whereas meat and vegetables and fruits were superior foods. However, the traditional food classification of inferior, normal, and superior foods must be modified to account for changing consumer environments due to social and economic factors and the growing effect of large distribution (drugstore, food chain etc.) to influence the consumer decisions. Prices signalled changes in marketing and in real income especially when higher inflation rate lasted for long periods. Taking into account changes in retailing we could also say that this elaboration was able to represented the impact of marketing strategies for food quality. This research has finally demonstrated that although the Italian consumer habits are still quite traditional, the reactions to historical and expected price changes reflect the consumer decision making in accordance with the different ways in which are ranked foods in terms of consumer preferences, marketing strategies and expectation about the future.

Notes

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[3] The authors wish to thank the anonymous reviewers and D. Moro for their helpful comment. The work was the result of a joint analysis; Molina developed the metodological framework and the theoretical implications, Rosa was responsible for the data collection, estimation and comments. Senior authorship was not assigned. This research was carried out also with funding of the University of Udine.

[4] It has long been recognised that preferences may not be intertemporally separable (Gorman, 1967). Nevertheless, intertemporal separability has been tested by Molina for French, Spanish, Greeck foods, using annual time series models.

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AN ANALYSIS OF CHANGES IN PORTUGUESE MEAT CONSUMPTION[1]

14

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1. Introduction

Only recently, in 1994, the Portuguese Food Balance ("Balança Alimentar Portuguesa 1980-1992"), was published by the Instituto Nacional de Estatística (INE). These new series gave continuity to earlier work on this subject, making available very interesting and up-to-date information concerning Portuguese food consumption.

The main purpose of this study is to use this new data to obtain estimates of elasticities of demand for the main meat products, pork, poultry, and beef, consumed in Portugal to gain a better understanding of recent developments in meat consumption. Previous estimates of these elasticity parameters date back to the eighties (Soares, 1985; Noème, 1989), some are too aggregated (Valério, 1987), and Portuguese consumption patterns have changed in response to significant changes in agricultural and trade policies, the organisation of marketing system, demographics, and macro-economic conditions in Portugal. Thus, these new estimates can be useful to those interested in policy analysis of the Portuguese meat sector and in projecting quantities demanded in face of the changes in market conditions generated by the liberalisation of international trade under the GATT agreements.

Since the Portuguese diet includes large quantities of fish when compared with the diets in other EC countries, per capita fish consumption was also brought into the analysis because it seemed inaccurate to study meat consumption while ignoring its main substitute. Our aim is to obtain accurate estimates of demand elasticities for meat, and therefore, we use a Linear Almost Ideal Demand System (AIDS) model. This model, presented below, has been used greatly, and discussed and tested in a number of empirical works on food consumption and, in particular, meat consumption.

Though household income and relative prices may explain most of the variation in per capita expenditures for the major categories of food (Connor, 1994), in general, and meat, in particular, the demand for meat is also influenced by many other

factors like "information about nutrition and health; generic advertising of product characteristics; changes in consumer perception about product quality, such as low fat or lean meat resulting from the adoption of biotechnology in animal production; concern over food safety; changing life styles and demographic structure; the effect of household value of time due to increased participation of women in the labor force; and expanded processing of basic commodities towards more convenience foods." (Kesavan and Buhr, 1992). Recent studies have paid explicit attention to some of these factors, like demographic changes, by introducing them in their demand system (Dono and Thompson, 1994).

Portugal has experienced a significant increase in the number of women in the workforce (from 38.5% of the total employable population in 1977 to 44.1% in 1992), so we expected that this change may have contributed to an expansion in the demand for "value-added products processed for the convenience of consumers" (Senauer, 1990), such as, processed chicken pieces and processed pork. Alternatively, this demographic change may have had a negative effect on beef and fish consumption. The work of Dono and Thompson (1994) for Italy (from 1971 to 1988) showed a significant relationship between a change in the number of women in the workforce and meat consumption which was favourable for poultry and pork but unfavourable for beef. In the analysis of the Portuguese case, we wanted to examine whether this variable has recently affected meat consumption in a similar manner.

2. Recent changes in meat consumption in Portugal

Meat consumption in Portugal currently accounts for 31.4% of total food expenditures (with pork being most consumed), and since the mid-eighties, livestock production has represented more than 50% of final agricultural production[3].

In the seventies, per capita meat consumption grew significantly with the significant increases in the real income of Portuguese families, resulting from policies favourable to imports and from improvements in market conditions following the revolution of 1974 (Valagão, 1990). However, this growth slowed at the beginning of the eighties, mainly as a result of a decrease in consumer purchasing power associated with a "severe internal economic crisis" (Pinto, 1985).

The unfavourable macro-economic conditions (high inflation, and increases in the budget and foreign trade deficits), associated with the Portugal's joining the European Union, pressured the Government to make dramatic changes in agricultural policies in 1983, by drastically reducing fertilizer and animal feed subsidies (Pinto, 1985).

For the Portuguese livestock sector, whose prices were essentially determined by market forces, it was the end of a long and very favourable trend in the evolution of

the intersectorial trade ratio. From 1963 to 1979, production in the livestock sector reacted to this evolution by growing at an average annual rate of 4.4%, beef and poultry having apparently benefitted most from improved animal feeds and low cereal prices (Albuquerque and Gomes, 1985).

Table 1: Meat and fish per capita consumption in Portugal: 1960 to 1992. (Source: BAP 1980 -1992)

(kg/person/year)

	1960 / 69	*1970 / 79*	*1980 / 84*	*1985 / 89*	*1990 / 92*
MEAT	**23.9**	**41.1**	**38.7**	**43.3**	**53.1**
Beef	7.8	12.7	9.9	10.5	13.3
Pork	6.5	9.4	10.1	12.9	15.8
Goat and sheep	2.9	2.5	2.0	2.2	3.0
Poultry	3.4	11.8	10.8	11.4	13.3
Giglets	3.3	4.4	5.0	5.3	6.2
FISH	**35.2**	**36.9**	**18.4**	**23.5**	**26.7**

Thus for the same period (1963 to 1979), in addition to the "explosion" in per capita meat consumption after 1970, there was a considerable growth of per capita consumption of poultry (898%)[4], which became the most consumed type of meat at the beginning of the eighties (Table 1), along with the main trends in the supply of animal products just discussed. A recent series published by the INE for 1980 to 1992, showed for the period after 1985 that all three categories of meat registered a steady growth (Figure 1), and pork had the most significant growth (74%), and is now the most consumed meat product.

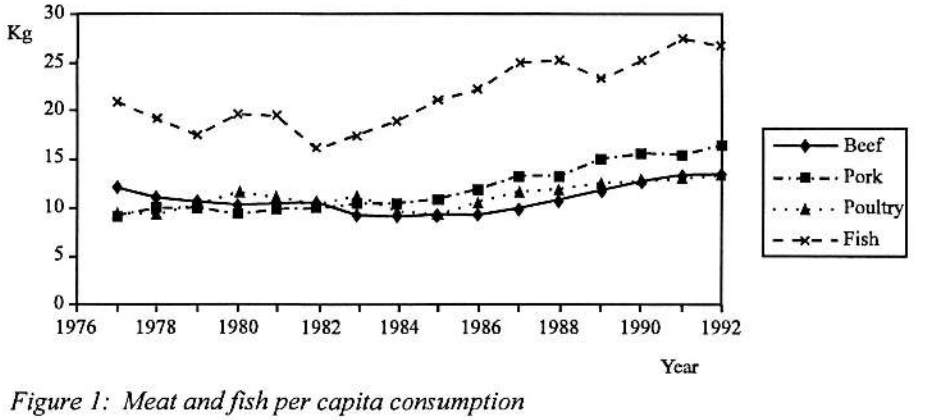

Figure 1: Meat and fish per capita consumption

The increasing relative prices of beef with respect to pork, poultry with respect to pork and fish with respect to pork (Figure 2) might have contributed to this. As it was noted before, demographic changes may have also favoured pork consumption, and in particular processed pork, as well as very recent health concerns on the part of consumers may have justified some shifts from beef to pork. Despite a favourable evolution in real prices (Figure 3) similar to that observed for pork prices, the per capita consumption of poultry grew only moderately.

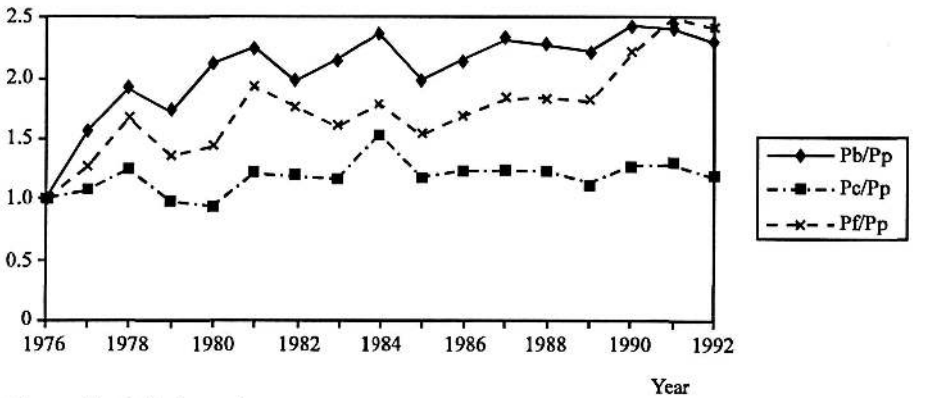

Figure 2: Relative prices

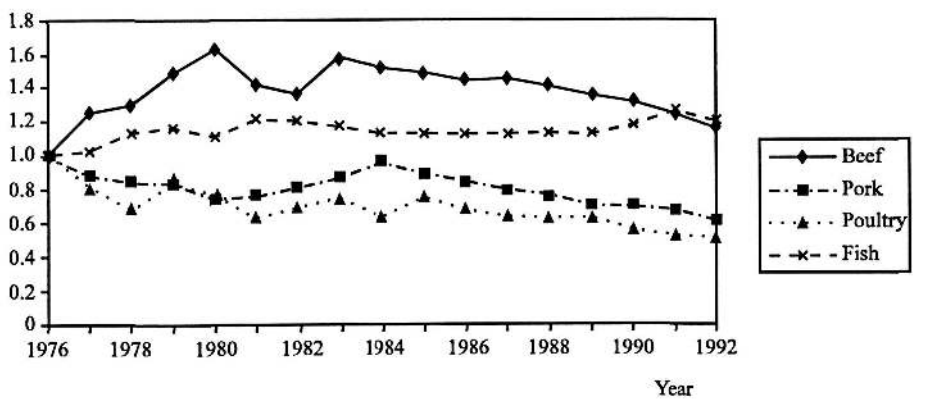

Figure 3: Real prices.

This may be explained by the high per capita consumption that has been attained since 1980 and by the unfavourable evolution in the price of poultry in relation to pork. Sheep and goat consumption also grew significantly (by 50%) from 1980 to

1992. However, the quantities are still so small (Table 1) that this group has not been considered in the empirical analysis.

The rapid growth in per capita meat consumption after 1985, associated with the progressive liberalisation of meat imports from other EU countries, and the inertia of internal production, resulted in a steady growth in imports. Finally, as mentioned earlier, Portuguese families traditionally consumed large amounts of fish. In the sixties per capita fish consumption exceeded 35 kilograms per year and was even greater than total per capita meat consumption. However, in the seventies, meat consumption exceeded this level and at the begining of the eighties, fish per capita consumption fell drasticly by about 50% when compared to the previous decade (Table 1).

Dried fish was a very common source of protein in the Portuguese diet with a per capita consumption of more than six kilograms in 1960. From then until 1980, its consumption decreased by 35.6% (Valagão, 1990), and since then has grown moderately by 4.2% per year up until 1992. Now dried fish represents only 18% of all fish eaten by Portuguese, the rest being fresh, frozen and canned fish. The diversification of food products and supply fluctuations due mainly to international fishing regulations may have contributed to the reduction in the share of dried fish as part of total fish consumption. Finally, fish per capita consumption increased significantly in particular since 1982 while real prices remained relatively stable, up until the beginning of the nineties.

3. The almost ideal demand system

The Almost Ideal Demand System (AIDS) has been widely adopted in agricultural economics, particularly in demand analysis, since its introduction in 1980 by Deaton and Muellbauer[5]. Its main advantages are that it is based on consumer demand theory, it is a flexible functional form model, and its results are consistent when aggregated over consumers. The "Linear Approximate" version of the AIDS (LA/AIDS), using Stone's geometric price index, provides a good approximation of AIDS and simplifies the estimation process. AIDS is specified as follows,

$$[1] \quad w_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i \ln (X/P) \qquad i = 1,...,n,$$

where w_i is the share of total expenditures on meat allocated to the i th meat product, p_j is the price of meat j, X is the per capita meat expenditure, and P is a price index defined as,

$$[2] \quad \ln P = \alpha_0 + \sum_j \alpha_j \ln p_j + \tfrac{1}{2} \sum_i \sum_j \gamma_{ij} \ln p_i \ln p_j.$$

The LA/AIDS version uses Stone's geometric price index with the share weighted P^* instead of P,

[3] $\ln P^* = \sum_j w_j \ln p_j.$

The restrictions of the consumer theory implies the following parametric restrictions,

[4] $\sum_i \alpha_i = 1$, $\sum_i \gamma_{ij} = 0$ and $\sum_i \beta_i = 0$ (additivity);

[5] $\sum_j \gamma_{ij} = 0$ for all i (homogeneity);

[6] $\gamma_{ij} = \gamma_{ji}$ for all $i \neq j$ (Slutsky symmetry)

The elasticities can be computed from the estimated parameters of the LA/AIDS model as[6],

[7] $\eta_i = 1 + \beta_i / w_i$;

[8] $\varepsilon_{ij} = - \delta_{ij} + (\gamma_{ij} - \beta_i w_j) / w_i$;

[9] $\varepsilon^*_{ij} = \varepsilon_{ij} + w_j \eta_i = - \delta_{ij} + (\gamma_{ij} / w_i) + w_j$,

where η's are expenditure elasticities, ε's are Marshallian elasticities (uncompensated), ε^*'s are Hicksian elasticities (income compensated), and δ_{ij} is the Kronecker delta.

4. Application to Portuguese meat demand: estimation model and data

In this study the LA/AIDS equations [1] and [3] were chosen to estimate the parameters of the Portuguese meat demand system (for beef, poultry, pork and fish), thus assuming weak separability from other food and nonfood commodities. Homogeneity and symmetry restrictions were imposed. For estimation purposes, error terms u_{it} were added to each equation. Those errors are assumed to be normally distributed with a zero mean and contemporaneous covariance matrix $\sum \otimes I_T$.

Since the meat expenditures shares added to one, one equation had to be dropped. The parameters of this share equation could be calculated using the additivity condition [4]. We chose the multivariate least squares estimation method[7] because the estimates were invariant to the choice of the excluded equation, and it computed the standard errors for elasticities estimates.

The model was estimated using annual Portuguese data from 1977 to 1992. Per capita consumption, in kilograms (kg), was obtained from the "Balança Alimentar Portuguesa 1980-1992" and from the "Estatísticas Agrícolas - 1982" for the years 1977 through 1979[8]. Price series were obtained by multiplying the 1980 retail prices by the retail price indices for the four products considered. These prices and indices were taken from the "Anuários Estatísticos"of the INE.

For the demographic variable we chose the specification that provided the best results: the total number of women as a percentage of the total active workforce. This variable was obtained from the "Anuários Estatísticos"of the INE.

5. Empirical results

The econometric estimates and the associated standard errors of the LA/AIDS model parameters, with homogeneity and symmetry restrictions imposed, are shown in Appendix (Table A.1). The model performed quite well in explaining changes in Portuguese meat consumption for the period 1977-92, and the overall results are acceptable[9].

As Figure 4 shows the model fits per capita consumption generally well, matching the turning points with accuracy.

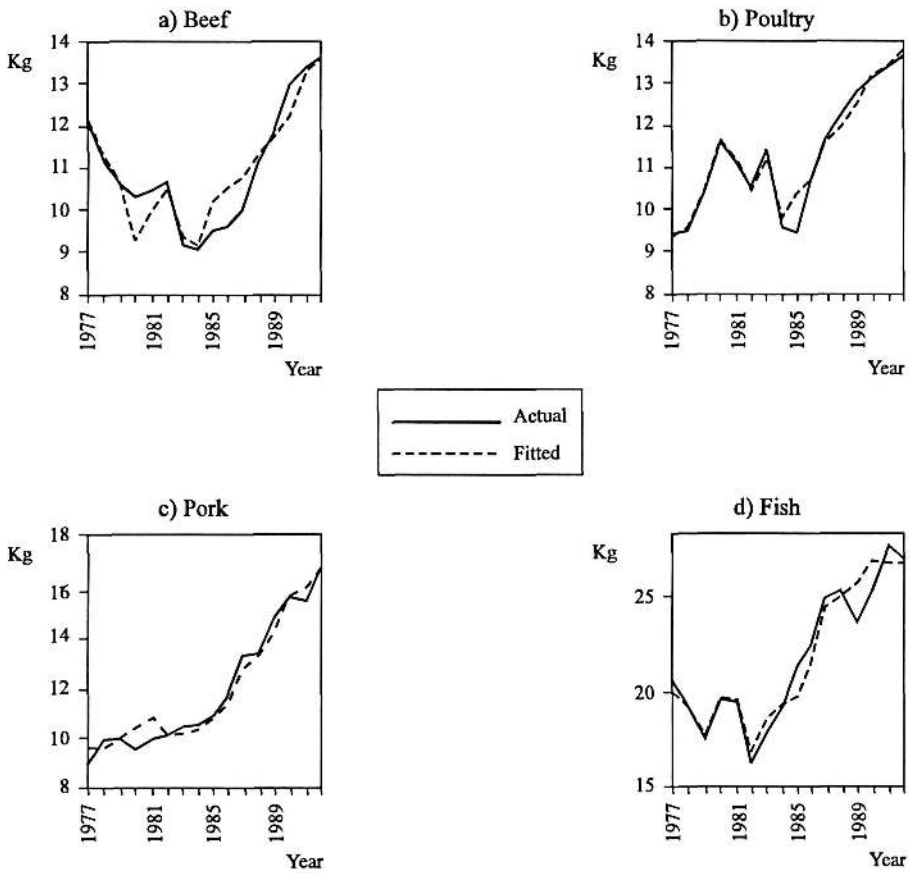

Figure 4: Per capita consumption: Actual versus fitted values

The expenditure, uncompensated and compensated elasticities, computed from parameters estimates, are presented in Tables 2 and 3. The expenditures elasticities range from 0.3 for poultry to 1.6 for fish and are all significantly different from zero. Fish is the only category with an expenditure elasticity greater than one. In contrast, poultry has the lowest expenditure elasticity, as we expected given the high level of its per capita consumption at the beginning of the eighties. Beef and pork with expenditure elasticities of about 0.8 are still quite sensitive to expenditure changes.

Table 2: Uncompensated price and expenditure elasticities.

	Prices				Meat
	Beef	Poultry	Pork	Fish	Expenditures
Beef	-1.164*	0.069	0.080	0.159	0.857*
	(0.169)	(0.045)	(0.143)	(0.145)	(0.207)
Poultry	0.368*	-0.558*	-0.237*	0.120	0.307*
	(0.119)	(0.105)	(0.113)	(0.148)	(0.145)
Pork	0.091	-0.145*	-0.400*	-0.382*	0.836*
	(0.138)	(0.043)	(0.160)	(0.130)	(0.198)
Fish	-0.055	-0.094	-0.622*	-0.823*	1.594*
	(0.145)	(0.056)	(0.135)	(0.190)	(0.193)

Evaluated at sample means.
Standard errors are in parenthesis.
* Statistically significant at 0.05 level.

Table 3: Compensated price elasticities.

	Prices			
	Beef	Poultry	Pork	Fish
Beef	-0.897*	0.162*	0.333*	0.402*
	(0.165)	(0.040)	(0.124)	(0.127)
Poultry	0.464*	-0.524*	-0.147	0.207
	(0.116)	(0.105)	(0.102)	(0.138)
Pork	0.352*	-0.054	-0.153	-0.144
	(0.131)	(0.038)	(0.144)	(0.115)
Fish	0.442*	0.080	-0.151	-0.371*
	(0.140)	(0.053)	(0.120)	(0.177)

Evaluated at sample means.
Standard errors are in parenthesis.
* Statistically significant at 0.05 level.

Uncompensated own-price elasticities range from a minimum of 0.4 for pork to a maximum of 1.2 for beef, and compensated own-price elasticities from 0.2 for pork to 0.9 for beef. According to the uncompensated cross-price elasticities estimates (Table 2), pork and poultry as well as pork and fish appeared to be gross complements, with negative and significant cross-price elasticities, while all uncompensated cross-price elasticities with beef are significantly different from zero, except for poultry[10]. All compensated cross-price elasticities with beef are positive and significant (Table 3), meaning that beef is a net substitute for poultry, pork and fish. For other combinations, compensated elasticities are not significantly different from zero[11]. The differences between the uncompensated and compensated price elasticities result from high meat expenditure elasticities.

The demographic elasticities, defined as the percentage change in per capita consumption resulting from a percentage change in the percentage of women in the workforce, are only significantly different from zero for pork and fish. Those elasticities estimates are 1.83 for pork and -1.46 for fish showing the expected effects previously discussed. In addition, in a previous analysis that did not include the demographic variable, price and expenditures elasticities were only slightly different from those presented above. The most significant difference concerned pork consumption. When the demographic variable is included, the effects of expenditure, own and cross prices changes are weaker. The expenditure and own-price uncompensated elasticities computed for 1977-92 are presented in appendix (Table A.2). Beef and pork expenditure elasticities remained relatively unchanged during the sample period, while fish elasticities show a decreasing trend, ranging from a maximum of 1.7 in 1979 to a minimum of 1.5 in 1991. Poultry elasticities increase to 0.4 in 1984 and then decrease to 0.2 in 1992.

Own-price elasticities indicate that fish is becoming slightly more price elastic over time while poultry and pork less elastic, and beef remains price elastic and relatively stable over the sample period.

6. Concluding remarks

The intention of this study is to contribute to a better understanding of recent changes in meat consumption patterns in Portugal. The observed changes have important implications for policy makers and for livestock producers. The results show that the LA/AIDS model chosen for the empirical analysis performs well and explains with accuracy annual variations in per capita consumption in Portugal from 1977 to 1992.

Although income and relative prices are still significant factors in explaining changes in meat consumption of Portuguese families, the demographic variable for the number of women as a percentage of the total active workforce shows a significant favourable effect on pork consumption and a negative effect on fish consumption, as was expected. This negative effect on the demand for fish indicates

that the fish industry should supply Portuguese consumers with processed products which are convenient, and recent changes indicate that the Portuguese food industry and its distribution channels are already aware of this and are providing a greater diversity of fish products. Per capita consumption of both beef and poultry are not significantly affected by the demographic variable, in the sample period. According to the empirical results, fish has a high expenditure elasticity and is a net substitute for beef. Thus, the inclusion of fish in the demand system was necessary.

Finally, a deeper understandig of changes in consumption for individual meat categories would need, namely, the disaggregation of the series to account for differences in fresh and processed products and a longer period of analysis. Seasonal and regional data, as well as, information about the health and quality concerns of Portuguese consumers, when available, can provide better insights in to the analysis of structural change.

Notes

[1] The authors wish to thank Florinda Veigas for her collaboration in obtaining the data and the anonymous reviewers for their comments.

[2] Department of Agricultural Economics and Rural Sociology, Instituto Superior de Agronomia, Universidade Técnica de Lisboa, Portugal.

[3] INE, "Portugal Agrícola", 1993.

[4] INE, "Balança Alimentar do Continente Português", Série: Estudo nº 51.

[5] Eales and Unnevehr (1988, 1993), Moschini and Meilke (1989), Hayes, Wahl and William (1990), Canali and Hayes (1992), Burton and Young (1992a, b) and Dono and Thompson (1994) are some of the most recent references for meat demand analysis.

[6] Assuming $d \ln P^*/d \ln p_j = w_j$ (Chalfant, 1987).

[7] LSQ estimation of Time Series Processor (TSP) program.

[8] During this period, the quantities did not have the same regional basis and had to be converted. This was possible because the two series had one year in common (1980).

[9] The hypothesis of no serial correlation could be tested with the usual Durbin-Watson statistic. Given the small number of observations the D.W. values fall in the inconclusive region for all products, except for poultry. For this equation the hypothesis of no serial correlation is accepted at the 1% level.

[10] Burton and Young (1992a) analysed meat and fish demand in Great Britain and found evidence of a sub-system of substitutes that comprised beef, lamb and pork. In this study, only beef and poultry were gross substitutes.

[11] These results are similar to those obtained by Burton and Young (1992a).

Appendix

Table A1: Parameters estimates of LA/AIDS model with homogeneity and symmetry imposed

Parameters	*Estimates*	*Std. errors*	*Parameters*	*Estimates*	*Std. errors*
α_B	0.312*	0.004	ϕ_F	-0.010*	0.005
α_C	0.109*	0.001	γ_{BB}	-0.065	0.052
α_P	0.295*	0.003	γ_{BC}	0.017	0.013
α_F	0.284*	0.003	γ_{BP}	0.012	0.039
β_B	-0.045	0.065	γ_{BF}	0.037	0.040
β_C	-0.075*	0.016	γ_{CC}	0.040*	0.011
β_P	-0.048	0.058	γ_{CP}	-0.048*	0.011
β_F	0.169*	0.055	γ_{CF}	-0.008	0.015
ϕ_B	-0.005	0.006	γ_{PP}	0.163*	0.042
ϕ_C	0.001	0.002	γ_{PF}	-0.126*	0.034
ϕ_P	0.013*	0.006	γ_{FF}	0.098*	0.050
Ln L = 164.22	Adj. R^2: B eq. = 0.47		C eq. = 0.87	F eq. = 0.84	
	D. W. : B eq. = 1.07		C eq. = 1.91	F eq. = 1.54	

Subscript: B - beef; C - poultry; P - pork and F - fish.
ϕ - parameter of the demographic variable.
Standard errors are in parenthesis.
* Statistically significant at 0.05 level.

Table A2: Expenditure and own-price elasticities computed 1977-1992.

Year	η_B	η_C	η_P	η_F	ε_{BB}	ε_{CC}	ε_{PP}	ε_{FF}
1977	0.867	0.296	0.837	1.652	-1.149	-0.552	-0.405	-0.790
1978	0.864	0.312	0.830	1.612	-1.154	-0.561	-0.383	-0.813
1979	0.863	0.309	0.853	1.715	-1.156	-0.559	-0.458	-0.753
1980	0.873	0.300	0.830	1.661	-1.141	-0.554	-0.380	-0.785
1981	0.864	0.344	0.814	1.568	-1.154	-0.577	-0.325	-0.839
1982	0.867	0.365	0.837	1.676	-1.150	-0.589	-0.404	-0.776
1983	0.858	0.408	0.844	1.682	-1.163	-0.611	-0.429	-0.772
1984	0.858	0.414	0.829	1.614	-1.163	-0.614	-0.378	-0.812
1985	0.849	0.280	0.849	1.604	-1.176	-0.543	-0.445	-0.818
1986	0.845	0.322	0.843	1.577	-1.183	-0.566	-0.426	-0.833
1987	0.844	0.296	0.838	1.548	-1.183	-0.552	-0.408	-0.850
1988	0.850	0.286	0.833	1.550	-1.174	-0.547	-0.390	-0.849
1989	0.852	0.254	0.850	1.613	-1.172	-0.530	-0.448	-0.812
1990	0.857	0.243	0.829	1.554	-1.164	-0.524	-0.378	-0.847
1991	0.848	0.219	0.814	1.484	-1.177	-0.511	-0.328	-0.888
1992	0.847	0.179	0.830	1.506	-1.180	-0.490	-0.379	-0.875

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A TEST OF DIFFERENCES IN FOOD DEMAND AMONG EUROPEAN CONSUMERS: A DYNAMIC APPROACH[1]

15

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1. Introduction

Food demand structures within the European Union (EU) member states are changing. In particular, the most important changes ocurred between the 1960s and 1980s. In the 1960s, the Mediterranean countries had diets that differed greatly from the northern European countries. The Mediterranean countries showed a predominance of cereals, fruits and vegetables, fish and vegetable oil, while meat, milk and dairy products, animal fats, and sugar were more abundant in northern European diets. The changes that began in the 1960s and have been taken place up to the present have resulted in a progressive northernization of the Mediterranean diet. These modifications are characterized by less importance for cereal products and a simultaneous increase in foods of animal origin, especially meat, milk, and dairy products.

On the other hand, the evolution of the northern diet is towards a healthier composition and, therefore, it is approaching the Mediterranean type. The economic convergence of the European Union is a phenomenon that also has an influence on the approximation of food consumption patterns across Europe. As a result, it can be said that differences in diets in the European countries are evening out. Gil et al. (1995) used two convergence measures to test whether some similarities are sustainable and showed that convergence could be observed for most products although the rate of convergence has decreased over the last decade.

This convergence is the result of several forces. First, there is a largely parallel trend in the determinants of food demand in European countries: the orthodox economic factors of household income, relative prices (as markets become more integrated), demographic changes and recent consumer concerns about nutrition and preventive dietary habits (Connor 1994). Second, there is an increase in vertical and horizontal integration of European firms related to technology transfers, multinational

marketing strategies (such as, European brands and promotions), and the internalization of food distribution. Third, similarities are evolving between governmental policies. Despite this process, there is still some consumption variation between the EU countries and, especially, between the southern and northern ones. It is difficult to talk about a "Euroconsumer" and to measure the differences or similarities among European consumers.

The objective of this paper is to give more insight into the similarities and differences between how consumers react to traditional economic factors pertaining to food consumption. We have selected three Mediterranean countries, Spain, Italy and France, and two northern European countries, Great Britain and Denmark, for our comparison. We specify and estimate a food demand system where prices and food consumption are the main determinants. Because some dynamic behavior is expected, we test different dynamic processes and the static model within a general dynamic framework.

The paper is organized as follows. First, some descriptive statistics on the evolution of the structure of dietary intake in the countries of the European Union and, especially, in Spain, Great Britain, Denmark, France and Italy, are outlined. Next, we discuss the dynamic adjustment process and Theil's (1969) multinomial extension of the linear logit model, hereafter, called GADS (generalized addilog demand system). Section 4 describes the main results, including the appropriate dynamic specification of the models and a discussion of the estimated elasticities. Also the existence of significant differences are tested. Finally, the main conclusions are outlined.

1.1 The Evolution of Diets in the European Union Member States

Table 1 shows the evolution of the per capita daily food consumption in the EU countries. The average food consumption in the EU countries was 3,055 Kilocalories per capita per day in 1962, and increased at an average annual rate of 0.7 percent to 3,493 Kilocalories per capita per day in 1992. Consumption in most countries has shown an upward trend except for Sweden, where it has remained constant, and Finland, where it has declined slightly. Spain and Portugal, countries with the lowest per capita consumption in 1962, have shown the largest increase (of about 33% and 37.8%, respectively, between 1962 and 1992).

In each country, the proportion of calories from animal products is lower than the proportion derived from vegetable products (Table 1), although there have been significant changes in many countries in recent years. In 1971, the differences were more significant, especially in the Mediterranean countries (Greece, Spain, Italy and Portugal). On average, vegetable and animal calories accounted for 80% and 20% of total food calorie intake, respectively. In the other countries, over 30% of total calories were derived from animal products.

Over time, two major trends have been observed. All countries, with the exception of Great Britain and Ireland, have shown an upward trend in the share of animal calories consumed over the period 1962-1982. However, from 1982-92, the share of animal calories consumed stabilized or even declined. The trend is positive only in the Mediterranean countries and in Denmark, although the growth rate has declined. On average, in 1992, EU countries derived 66% and 34% of their total consumed calories from vegetable and animal products, respectively.

Table 1: Evolution of average caloric intake in EU countries (Kcal/capita/day). (Source: FAO (1995))

	1962		1972		1982		1992	
	Total calories	Animal calories	Total calories	Animal calories	Total calories	Animal calories	Total calories	Animal calories
Belg.-Lux.	3077	34.1	3198	36.7	3467	36.8	3680	35.3
Ireland	3358	37.1	3438	37.8	3639	37.0	3847	33.4
Denmark	3231	37.3	3272	40.4	3427	41.9	3663	43.5
Finland	3153	41.6	3178	41.9	3110	44.1	3018	39.6
France	3321	33.1	3310	37.9	3498	38.7	3633	40.0
Germany	2992	34.3	3201	34.9	3386	35.3	3344	34.7
Greece	2816	16.4	3206	21.1	3533	24.6	3815	25.2
Italy	2982	16.2	3462	19.6	3395	24.9	3560	25.4
Holland	3057	34.0	3063	33.3	3059	38.2	3222	31.7
Portugal	2635	14.5	3025	17.4	2954	27.5	3633	26.0
Spain	2788	15.6	2905	24.0	3304	30.1	3707	31.9
Sweden	2870	37.5	2891	34.0	3005	39.0	2971	37.6
Austria	3245	33.7	3253	34.8	3410	36.8	3497	35.6
Great	3252	41.7	3204	41.2	3159	40.0	3317	32.4
Mean	3055	31.2	3186	32.5	3310	34.9	3493	33.7

At first glance, it appears that the consumption patterns in the EU countries have changed. This evolution shows how the traditional Mediterranean diet, once characterized by a high proportion of energy from vegetables products, is approaching the northern diet, where the proportion of Kilocalories from animal products used to be much higher. In order to confirm this, we must look for the desegregated data from different products.

First, we classified the elements of both diets in order to study the evolution and to compare it with the present. In the early 1960s, the Mediterranean diet became

known for its healthly properties, and nutritionists began comparing the Mediterranean diet with the northern European diet (Ferro-Luzzi and Sette, 1989). Figure 1 shows the evolution of the average consumption of different products for the southern (France, Greece, Italy, Portugal and Spain) and northern (Austria, Belgium-Luxembourg, Denmark, Finland, Germany, Ireland, Netherlands, Sweden and Great Britain) European Union countries from 1962 to 1992. We observed that, in 1962, the consumption of cereals, rice, pulses and nuts, fruits, vegetables, vegetable oils and fish was higher in the Mediterranean countries, while the consumption of meat, milk and dairy products, eggs, sugar and animal oils was greater in the northern European diet.

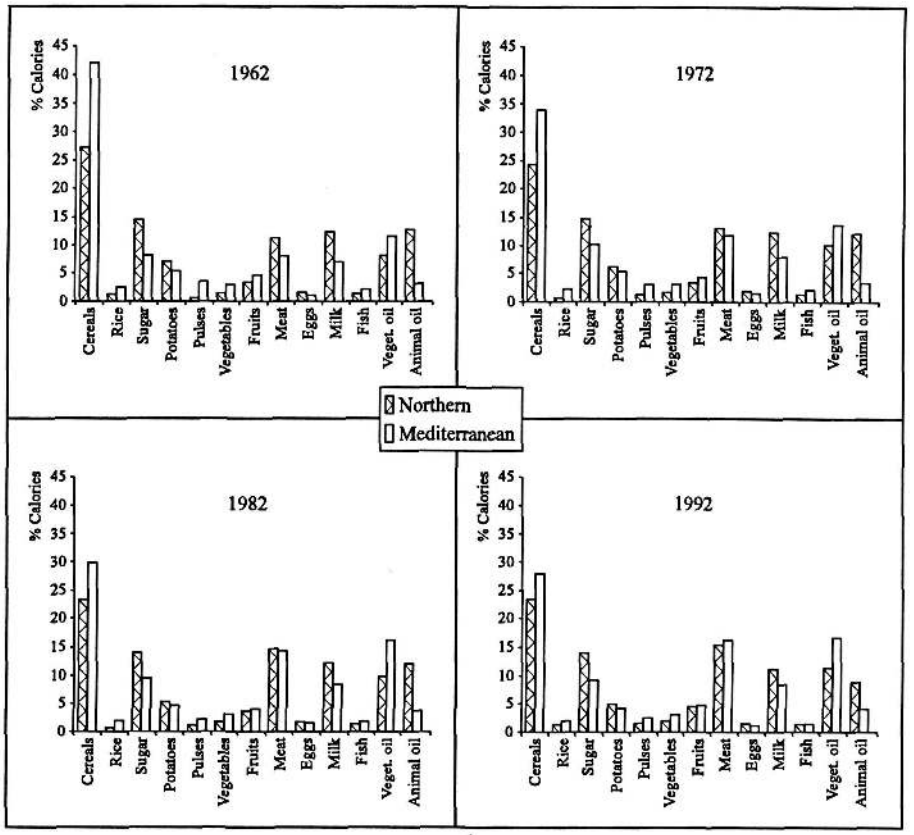

Figure 1: Comparison between the mean dietary patterns of northern and southern European countries in 1962, 1972, 1982 and 1992 (Source: FAO (1995))

There has been a considerable drop in the amount of cereals consumed in both the southern and northern countries (although it is higher in the South). Therefore, the

differences among them are now smaller. On the other hand, an increase in the consumption of meat, fruit and vegetable oils can be observed for both groups, while the consumption of pulses and nuts, fish, and animal fats has declined. These changes indicate an obvious "northernization" of the Mediterranean diet, and a "Mediterraneanization" of the northern diet. The greatest differences in consumption patterns in the early 1960s have been reduced for every product except vegetable oil.
At this point, it is interesting to determinate whether this convergence drives similar consumer reactions to income and prices in food demand. To answer this question, a food demand system for France, Italy, and Spain, (South Europe) and Denmark and Great Britain (North Europe) is estimated. Because of the lack of data necessary for estimation (of the expenditures and quantities consumed for different products), food products have been aggregated into the following broad categories: cereals, meat, fish, milk and dairy products, fruits and vegetables (including starchy products), and fats and oils.

Before going on with the analysis, a brief description of the evolution of dietary and food expenditure structures, for the countries mentioned above follows in order to better clarify the estimation results.

In the 1960s, the proportion of cereal consumption decreased by about 10 to 20% in all the countries, except for Spain where the decrease reached 32%. This proportion continued to decrease gradually from 1972 to 1992, but at a lower rate, while it increased in Great Britain and Denmark. Finally, cereal consumption in Italy is still much higher than in all the other countries.

The share of meat calories increased over the whole period in Spain, Italy and Denmark. Spanish meat consumption showed the greatest increase by almost doubling between 1962 and 1972, and almost doubling again between 1972 and 1992. In Denmark and Italy, consumption increased gradually by 77% and 10%, respectively over the same period. On the other hand, in Great Britain and France, relative meat consumption grew a little from 1962 and 1972, but then, remained steady in France, and even decreased in Great Britain (due to a decline in lamb and beef consumption). The share of meat in the Italian diet was the lowest for the five countries.

The consumption of fish grew in absolute terms in all the countries between 1972 and 1992. The highest upward trend took place in Italy (a 63% increase between 1972 and 1992), the country with the lowest initial consumption. Danish fish consumption was the highest among the countries over the period (30% more than spanish consumption and 250% more than British consumption in 1992). However, if we analyze the caloric share for fish, it decreased in Spain, and remained constant in Great Britain, France, and Denmark from 1972 to 1992 (although some increases were observed in Denmark in 1982). The share of milk, dairy, and eggs increased in Spain, France and Italy and remained constant in Great Britain and Denmark from 1962 to 1982, while it decreased in all the countries after that.

Table 2. Evolution of diets in Spain, Great Britain, Denmark, France and Italy (% calories) (Source: FAO (1995))

	Cereals	Meat	Fish	Milk-Eggs	Fruits-Veg.	Fats
1962						
Spain	44.6	6.2	1.9	6.8	17.7	14.2
Great	27.4	16.0	0.7	12.9	8.1	18.6
Denmark	24.8	14.9	1.5	10.7	10.7	20.7
France	32.1	16.1	1.3	11.9	14.9	13.1
Italy	48.1	5.8	0.9	7.7	13.4	15.5
1972						
Spain	30.4	11.4	3.0	9.8	19.3	15.9
Great	23.1	17.4	0.6	13.3	11.4	19.6
Denmark	22.2	16.0	2.4	10.1	9.0	24.1
France	25.9	19.5	1.3	12.8	12.8	15.5
Italy	41.6	8.4	0.9	8.6	12.1	18.7
1982						
Spain	25.2	18.3	2.4	10.1	16.2	19.5
Great	22.5	26.1	1.0	12.9	12.3	19.6
Denmark	21.5	19.8	3.6	10.2	8.7	21.8
France	26.5	18.4	1.2	13.6	10.8	19.5
Italy	36.8	10.8	0.6	10.2	12.2	19.9
1992						
Spain	22.7	21.5	1.7	8.2	16.1	21
Great	24.2	15.1	1.0	12.0	12.7	21.1
Denmark	23.6	26.4	2.3	7.9	9.9	17.0
France	25.1	18.9	1.3	13.4	10.0	20.3
Italy	34.6	11.5	1.1	8.5	12.7	2.3

The share of calories from fruit and vegetable is consistently higher in Spain than in the other countries, but some decreases were observed, as was the case in Denmark, France and Italy. Great Britain and France showed an increase in the relative importance of these products. The fats and oils consumption evolved towards a

convergence; its share increased in all countries except for Denmark, the only country with a downward trend.

Figures 2 and 3 show the evolution in the structure of food expenditures in selected countries. In order to make data comparisons, food expenditures are expressed in percentages. In all the countries, expenditures for meat are the greatest, accounting for 32% of food expenditures in Spain; 36% in the United Kingdom and Denmark; 40% in France; and 35% in Italy. Fruits and vegetables are becoming more important in the food expenditures structure, with an upward trend in all the countries although the largest increase took place in the UK (more than 25% over the last 20 years).

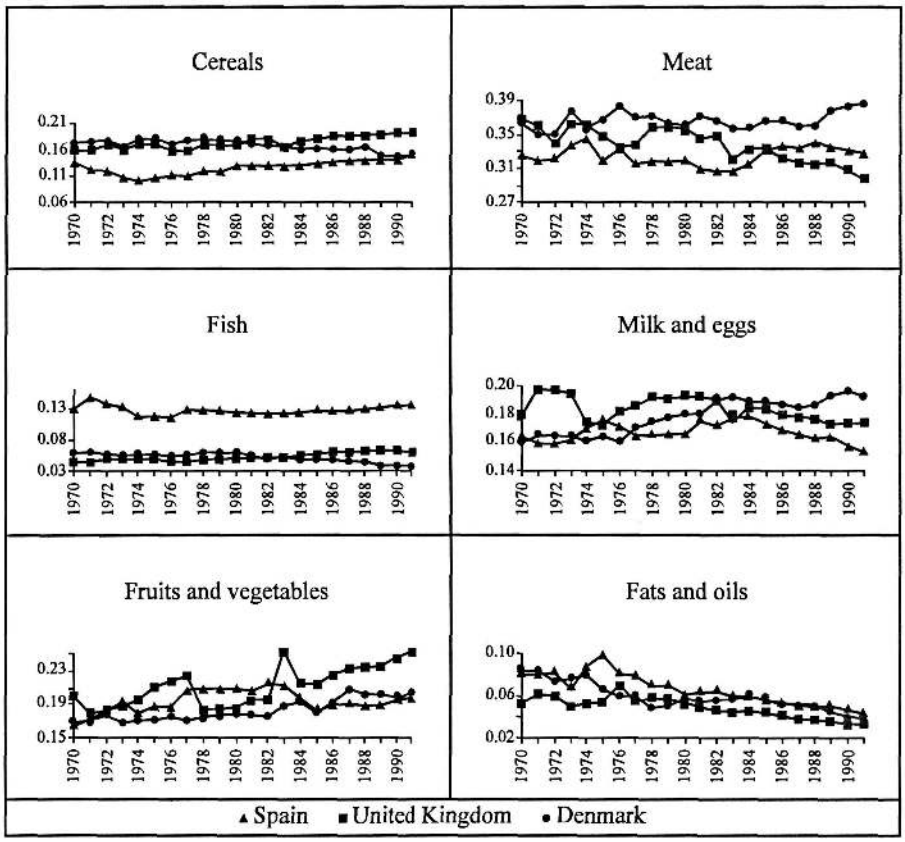

Figure 2: Evolution of expenditures for food in Spain, UK and Denmark (%).

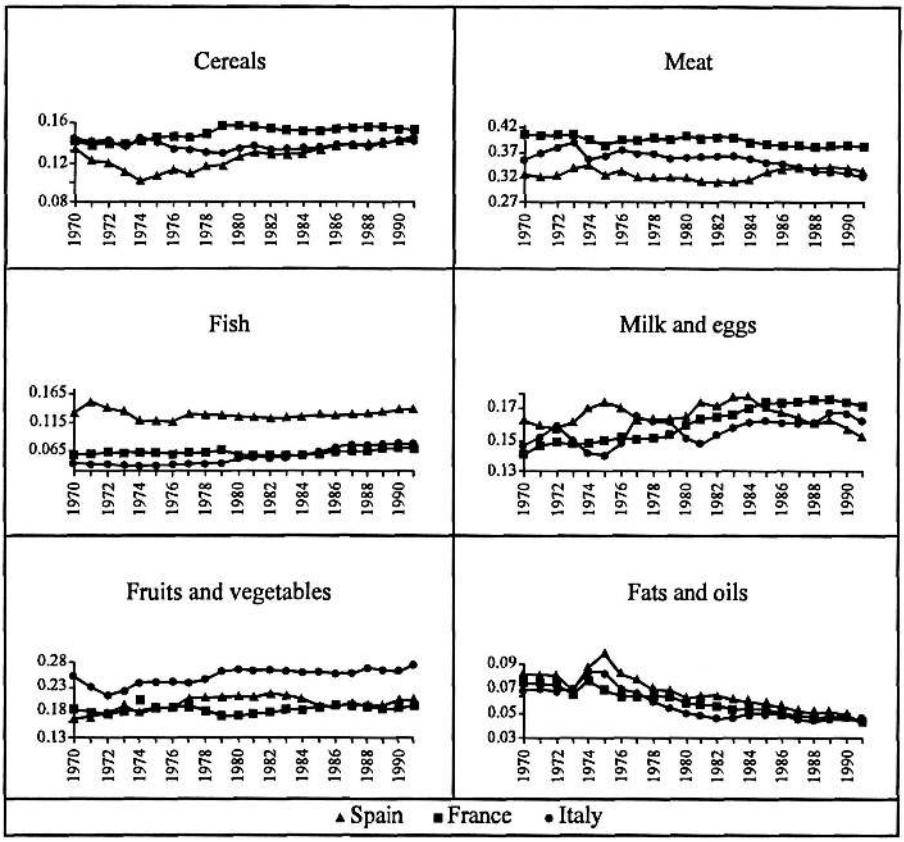

Figure 3: Evolution of expenditures for food in Spain, France and Italy (%).

Expenditures for oils and fats dropped in relative terms in all countries, over the years, and most significantly in Denmark (with a decrease of about 55%). However, the main differences between Spain and the other countries were found for fish consumption. The relative importance of fish expenditures in Spain was almost three times the average expenditures in the other countries. The upward trend in relative fish expenditures in France (nearly 25% increase over the last 20 years), and the downward trend in Denmark (nearly 35%) are remarkable. The relative importance of expenditures for cereals increased slightly in Spain, France and the United Kingdom between 1970 and 1991. However, in Italy and Denmark, the trend had the opposite sign. The Danish decrease was 13% between those years. Finally, for milk, dairy products and eggs, Spain and the United Kingdom showed a slight downward trend while the relative importance of these products in the other countries increased, mainly in Denmark (by 20-21%) and France (by 21%). Thus, in

general terms, although a certain convergence has taken place, differences still remain, implying that differences in food elasticity among countries are expected.

2. Methodology

Economic studies of food demand often show that consumers do not adjust instantaneously to changes in prices, income or other determinants of demand (the static approach). Consumer reactions to changes in income and prices do not occur immediately, but take place gradually. Brown (1952), Houthakker and Taylor (1970), and Philips (1983) try to explain the source of these lags. First, consumers adjust slowly to changes in income and prices because there is some inertia in their reaction to these changes. The inertia is due to consumers memories of the previous levels of income and prices. Secondly, a lag effect in consumer demand is produced by the consumption habits that people have as a result of past behavior. The habits, customs, and levels associated with previous consumption remain a part of consumer behavior, and past consumption exerts a stabilizing effect on current consumption. However, both phenomena seem to be present in consumer demand.

Incorporating this dynamic behavior in demand analysis begins with the simple *ad hoc* scheme that is the partial adjustment model so often used for durable goods and used for the first-order autoregressive for nondurables. An alternative for identifying the appropriate model specification for demand is to develop a relatively general framework incorporating the alternative hypotheses related to dynamics and allowing for direct estimation of long-run coefficients (Anderson and Blundell, 1983). It is assumed that changes in endogenous variables are responses to anticipated and unanticipated changes in exogenous variables needed to maintain a long-run relationship between them.

The general dynamic demand framework that assumes a first-order autoregressive distributed lag model (p=1 and q=1) is the following model in a error-correction form (ECM):

$$[1]\ \Delta Y_t = \Delta X_t \Phi A - (Y_{t-1} - \Phi X_{t-1})\lambda + \varepsilon_t$$

where Y_t is a vector of endogenous variables; X_t is a vector of exogenous variables (income and prices); A is a matrix that relates short and long-run coefficients; λ is the adjustment coefficients matrix; and Φ is the long-run coefficients matrix.

Equation [1] nests other dynamic specifications, such as, partial adjustments (PA), first-order autoregressives (AR), and the static model, by imposing some parameter restrictions ($A = \lambda$, $A = I$ and $A = \lambda = I$, respectively) (see Angulo et al., 1996, for a complete description of the process).

The model defined by [1] is still too general for estimation. To avoid the large number of parameters which must be determined using a relatively small sample, a diagonal adjustment is assumed; that is, the matrices A and λ must be scalar. In this

context, all equations in the system adjust in the same way to the deviations from the long-run equilibrium. In any case, the adding up restriction is guaranteed.

This general dynamic has been applied to the generalized addilog demand system (GADS) developed by Theil (1969). This model guarantees the non-negativity of the estimated average budget share and satisfies the aggregation, homogeneity and symmetry restrictions if we impose some linear restrictions on the estimated parameters. Applications can be found in Bewley and Young (1987) for meat demand in Great Britain, and in Gaiha and Young (1989) for cereals and starchy products in developing countries. The GADS model assumes that budget shares have the following structure:

$$[2] \qquad w_{it} = \frac{e^{\delta_{it}}}{\sum_k e^{\delta_{kt}}}$$

where: $\delta_{it} = \alpha_i + \beta_i \ln y_t + \sum_{j=1}^{n} \gamma_{ij} \ln p_{jt}$

with w_{it} being the average budget share of the i-th good in period t (t = 1,2,...T); y_t the total expenditure in period t (t = 1,2,...T); and p_{jt} the price of the j-th good in period t (t = 1,2,...T).

Equation [2] is difficult to estimate, and some transformations are needed for estimation purposes. After those transformations (Bewley and Young 1987), we derive the following GADS linear version which directly gives the estimated elasticities:

[3] $\ln \left(\frac{q_{it}}{w_t^+} \right) = a_i^* + \eta_i \ln y_t + \sum_j E_{ij} \ln p_{jt}$ where q_{it} is the quantity consumed of *i*-th good in period *t* (*t* = 1,2,3,...*T*); η_i the expenditure elasticity evaluate at the mean budget share; E_{ij} the price elasticities for the mean budget share; and $\ln w^+ = \sum_i w_i \ln w_i$; $a_i^* = (\alpha_i - \sum_j w_j \alpha_j)$;

If we want to test the general restrictions of demand theory (homogeneity and symmetry), it is necessary to make further transformations. By multiplying Equation [3] by $_i$ and rearranging the terms, we have:

[4] $\overline{w}_i \ln \left(\frac{q_{it}}{w_t^+} \right) = a_i + \theta_i \ln \left(\frac{y_t}{P_t^+} \right) + \sum_{j=1}^{n} \pi_{ij} \ln p_{jt}$ where $\ln P^+ = \sum_j w_i \ln p_j$; $a_i = w_i a_i^*$; and θ_i and π_{ij} are the marginal budget shares and the Slutsky

parameters, respectively, calculated for the mean budget share. The adding up restriction implies that $\sum_i a_i = 0$; $\sum_i \theta_i = 1$; and $\sum_i \pi_{ij} = 0$,

and homogeneity and symmetry imply that $\sum_j \pi_{ij} = 0$ and $\pi_{ij} = \pi_{ji}$.

Furthermore, the average estimated budget shares are positive and sum to unity.

3. Estimation and results

The data come from a number of sources. In Spain, Denmark, France and Italy information about food expenditures were taken from the National Accounts collected by EUROSTAT. However, data on quantities of food consumed were not available, so caloric intake data from the FAO database was used. In order to get per capita data, population figures for those countries were collected from the International Monetary Fund. In the United Kingdom, data on the per capita quantities of food consumed and expenditures were obtained from the National Food Expenditure Survey conducted by the Ministry of Agriculture, Food and Fisheries.

Since the GADS system adds up, the sum of the residuals across the equations is equal to zero ($\Sigma \epsilon_{it}=0$), and the variance and covariance matrix of the residuals is singular. To overcome this problem, one equation must be arbitrarily deleted and a systems estimator applied to the remainder of the system. The oils and fats equation was deleted, and the systems was estimated using the full information maximum likelihood (FIML) procedure. Weak separability was also imposed. Restrictions guided by economic theory (homogeneity and symmetry) have been included in the model following, among others, Anderson and Blundell (1983) and Kesavan et al. (1993).

Several tests have been performed in order to derive the most appropriate dynamic specification. The static specification assumes an instantaneous adjustment to the new equilibrium values when prices or income change. Obviously, a static approach does not provide a realistic description of how consumers behave in real life. In fact, consumers very often react with some delay to price and income changes, with the implication that an adjustment towards a new equilibrium is spread over several time periods (Philips, 1987). The origin of these lags is inertia and habit formation. Inertia means that consumers are slow to adjust their consumption to changes in current income and prices. It means that, if income and/or prices change, the effect on the quantity consumed is not instantaneously made because they have the previous levels of those variables in mind and, therefore, do not change their consumption until they realize that income or prices have changed. The dynamic model behind this hypothesis is the autoregressive specification where the changes in the endogenous variable depends on both current and past values of the

exogenous variables. Habit formation means that consumers make their decisions about current consumption by taking consumption in previous periods in account. In other words, past consumption exerts an important effect on current consumption because some habits have been developed. A partial adjustment model is behind this hypothesis where changes in consumption depend on actual values of exogenous variables and on past consumption levels.

Because all the alternatives are nested in equation [1], a likelihood ratio test is used. Table 3 shows the likelihood ratio test performed to discriminate among the alternative models (partial adjustment, first-order autoregressive and static) for all the countries. As in equation [1], A and λ are scalars, and only one restriction is imposed on the model in the error correction form to get the autoregressive specification. Also, one restriction is imposed to get the partial adjustment model, and two, to get the static specification. In all tests, the null hypothesis is that the restrictions are true. Results indicate that the hypotheses of partial adjustment or static forms is too restrictive for the data. In all countries, the first-order autoregressive form seems to be the correct dynamic specification at the 1% level of significance. The autoregressive specification implies, as mentioned before, that changes in food demand not only depend on actual income and prices but also on lagged values of these variables. It means that consumers base their consumption on some initial level. Also, from Table 3 and from this point of view, it is possible to conclude that the dynamic behavior of Spanish, British, Danish, French and Italian consumers is similar.

The rejection of the partial adjustment implies that habit formation does not play an important role in explaining food consumer behavior in all the countries and that past consumption levels do not exert any influence on actual consumption. This conclusion was expected because, as we saw in the descriptive section, food consumption in the analyzed period changed in all the countries in such an important way that no food habit may persist any longer. Finally, the rejection of the ECM form means that actual consumption does not need to be adjusted in the short-run towards a long-run equilibrium since there do not appear to be strong deviations between short-run and long-run consumer behavior.

The estimated coefficients for which homogeneity and symmetry was imposed for all the countries are not presented because of space limitations.[4] All income and own-price parameters are statistically significant at the 1% level. The λ parameter, which introduces lagged values in the models, is highly significant, indicating that it is an important determinant in consumer demand for food. Also, cross-price parameters are generally significant. Finally, Harvey's (1982) autocorrelation test was used, and we failed to reject the null hypothesis for no autocorrelation (the system statistic is 1.87 while the critical value at the 5% level of significance is 3.84), indicating that the model was correctly specified.

Table 3: Testing for alternative dynamic specifications

		SPAIN		
	Log L	LR	D.F.	Critical V. (1%)
MCE	590.91			
Autoregressive	589.78	2.26	1	6.63
Partial	586.23	9.36	1	6.63
Static	585.15	11.53	2	9.21
		UNITED KINGDOM		
	Log L	LR	D.F.	Critical V. (1%)
MCE	694.54			
Autoregressive	694.53	0.02	1	6.63
Partial	680.82	27.44	1	6.63
Static	680.12	28.83	2	9.21
		DENMARK		
	Log L	LR	D.F.	Critical V. (1%)
MCE	493.07			
Autoregressive	492.32	1.5	1	6.63
Partial	488.81	8.52	1	6.63
Static	488.40	9.34	2	9.21
		FRANCE		
	Log L	LR	D.F.	Critical V. (1%)
MCE	535.85			
Autoregressive	535.69	0.32	1	6.63
Partial	523.87	23.96	1	6.63
Static	522.86	25.98	2	9.21
		ITALY		
	Log L	LR	D.F.	Critical V. (1%)
MCE	498.09			
Autoregressive	498.08	0.02	1	6.63
Partial	494.15	7.88	1	6.63
Static	492.12	11.94	2	9.21

Log L: Log of likelihood Functions;LR: Likelihood Ratio;DF;
Degrees of Freedom; Critical V;Critical Value

3.1. Estimated Elasticities

The most interesting economic parameters for policy analysis are elasticities. No distinction can be made between the long and short-run in the AR/GADS model. Tables 4 and 5 present the estimated expenditure and own-price elasticities calculated at mean values for all countries (the t-ratios are in parentheses).

Table 4: Expenditure elasticities calculated at mean values

	SPAIN	UNITED KINGDOM	DENMARK	FRANCE	ITALY
Cereals	0.77	0.53	0.88	0.84	0.51
	(4.31)	(4.08)	(6.62)	(2.76)	(3.09)
Meat	1.54	1.28	1.37	0.90	1.58
	(9.11)	(9.78)	(9.24)	(4.52)	(7.29)
Fish	0.81	0.68	0.52	2.11	0.94
	(2.71)	(1.59)	(1.91)	(4.31)	(2.15)
Milk -	0.64	0.87	1.32	1.18	0.48
Eggs	(3.54)	(4.55)	(7.59)	(4.13)	(2.37)
Fruit-	0.90	1.05	0.69	0.97	0.89
veget.	(5.01)	(4.73)	(4.18)	(2.29)	(3.71)
Fats- Oils	0.35	1.20	-0.61	0.45	0.53
	(1.24)	(5.86)	(-2.03)	(0.95)	(1.33)

In Spain, most of the food products have food expenditure elasticities of less than unity. Only meat has a estimated elasticity greater than unity, implying that this product has the highest ranking for household food expenditures. Due to the weak separability assumption, the results must be evaluated within the context of total food expenditure for the six food groups. In the United Kingdom, meat, fruits and vegetables, and oils and fats have elasticities greater than unity while fish, milk and eggs, and cereals have inelastic food expenditures. Results are as expected since fruits and vegetables are more expensive in the United Kingdom than in Spain, where fruits and vegetables production is important. On the other hand, fish consumption is higher in Spain so it becomes more elastic than in the United Kingdom. The t-ratios are generally higher than the critical value for a 1% level of significance of 2.65, so real income has important explanatory power. In Denmark, meat and milk, dairy products, and eggs have elasticities greater than unity while cereals, fish, and fruits and vegetables have inelastic food expenditures. The elasticity of oils and fats is negative, although not significantly different from zero. Danish oil consumers do not respond to changes in total food expenditures. Finally, the inelasticity of fish is explained by the fact that although Denmark is the most important consumer country in terms of Kilocalories per capita per day, the relative importance of fish expenditures as a part of total food consumption is around 3%, showing a downward trend for the period. For France, fish and milk and eggs have

an estimated elasticity greater than unity, while the rest of the products have inelastic demand. The demand for fish is very elastic as expected from its increasing importance not only in caloric fish intake, but also in the relative importance of fish expenditures. These same reasons explain the elasticity of milk, dairy products and eggs with a clear upward trend in relative expenditures and caloric intake. Finally, in Italy, the only product that has an estimated elasticity greater than unity is meat. Although cereals are important for Italian consumers, they are considered to be traditional foods, so it is understandable that cereal consumers do not respond to changes in total food expenditures.

Table 5: Own-price elasticities calculated at mean values

	SPAIN	UNITED KINGDOM	DENMARK	FRANCE	ITALY
Cereals	-0.42	-0.21	-0.66	-0.57	-0.67
	(-9.9)	(-5.17)	(-11.21)	(-6.29)	(-12.64)
Meat	-0.80	-0.49	-0.85	-0.80	-0.92
	(-11.5)	(-19.72)	(-10.51)	(-15.43)	(-13.13)
Fish	-0.71	-0.41	-0.62	-0.36	-0.49
	(-8.13)	(-3.48)	(-11.54)	(-4.42)	(-4.19)
Milk -	-0.56	-0.23	-0.98	-0.77	-0.32
Eggs	(-7.11)	(-5.44)	(-16.01)	(-8.38)	(-3.99)
Fruit-	-0.46	-0.30	-0.53	-0.68	-0.53
veget.	(-6.4)	(-11.31)	(-6.95)	(-6.56)	(-6.87)
Fats- Oils	-0.23	-0.14	-0.27	-0.17	-0.32
	(-3.38)	(-4.86)	(-3.51)	(-2.32)	(-3.75)

All the uncompensated own-price elasticities are negative; that is, changes in own prices have an inverse impact on quantities demanded. Also, for all countries and for all food groups, the estimated elasticities are less than unity; however, Spanish elasticities are consistently higher than in the UK and more similar to the other countries. In general terms, in all countries, products with the highest expenditure elastic demands are also the most price elastic. Meat has the highest ranking of household food own-price responses, followed by fish in Spain; fish and fruits and vegetables in the UK; milk and eggs in Denmark and France; and cereals and fruits and vegetables in Italy.

Differences in demand elasticities between countries were tested. In order to not complicate the analysis, only differences between Spain and the remaining countries were tested. To carry out this analysis, the AR version of the GADS model (3) was used because it directly provides the elasticities. First of all, data from Spain and the United Kingdom were pooled, and the appropriate dummy variables were defined. An ordered sequence of tests was carried out. The results are shown in Table 6.

Table 6: Testing significant differences in food demand elasticities between Spain and other European countries.

	SPAIN AND UNITED KINGDOM		
	Log	LR	Critical Value (1%)
General	720.13		
All coefficients	661.94	116.39	63.69
Intercepts	718.53	3.204	15.08
Expenditure parameters	704.69	27.68	15.08
Prices parameters	663.08	110.89	50.9
	SPAIN AND DENMARK		
	Log	LR	Critical Value (1%)
General	569.44		
All coefficients	430.87	277.14	63.69
Intercepts	493.89	151.10	15.08
Expenditure parameters	556.68	25.52	15.08
Prices parameters	446.14	246.6	50.89
	SPAIN AND FRANCE		
	Log	LR	Critical Value (1%)
General	600.60		
All coefficients	509.70	181.80	63.69
Intercepts	551.49	98.22	15.08
Expenditure parameters	588.01	25.18	15.08
Prices parameters	525.31	150.58	50.89
	SPAIN AND ITALY		
	Log	LR	Critical Value (1%)
General	564.72		
All coefficients	451.04	227.36	63.69
Intercepts	522.50	84.44	15.08
Expenditure parameters	560.83	7.78	15.08
Prices parameters	474.86	179.72	50.89

Log : Log of Likelihood function.
LR: Likelihood Ratio.

First, differences in all model parameters (intercept and demand elasticities) were tested. Results indicate that the null hypothesis of no differences is rejected. Therefore, both countries show different food patterns even though the dynamic structure of food consumer behavior is similar, (the AR model was chosen in both cases).

Next, only differences in the intercepts were tested by introducing dummy variables for affects from prices and expenditures. We failed to reject the null hypothesis of no differences; that is, average budget shares were similar between both countries. Next, differences in food expenditure parameters were tested by introducing dummy variables which only affected price slopes. The null hypothesis of no differences was rejected. Thus, Spanish and British consumers ranked food products in a different way from the total food expenditure point of view.

Finally, differences in price elasticities were tested by defining dummy variables which affected the food expenditure parameters only. Again, in this case, the null hypothesis of no price differences was rejected, and as shown, the price elasticities were higher in Spain than in the UK even though both sets were inelastic.

The same analysis was used to test differences between Spain and Denmark. The result led us to fail to accept the null hypothesis of no differences in all tests, so the average budget shares, the food expenditures and the price elasticities were different for both countries. Therefore, the only similarity was the dynamic structure of food consumer behavior.

Differences between French and Spanish consumers were also tested with the same conclusions as for the previous case (different food expenditures and price elasticities were expected; see Tables 4 and 5). When comparing Spanish and Italian consumers, the only test for which we failed to reject the null hypothesis was in testing for differences in food expenditure parameters (in fact, estimated expenditure elasticities were ranked in almost the same way for both countries). This implies that Spain and Italy not only have a similar dynamic structure, but also classify food products for food expenditure in the same way.

4. Concluding remarks

In recent years, the composition of the Mediterranean diet has received enormous amount of attention and gained popularity not only among nutritionists and scientists, but also among consumers because of its healthy characteristics. Initially, the Mediterranean diet was considered healthy because it was low in fat. However, epidemiological and scientific evidence shows that it is also good because it regulates the intake of antioxidants and lowers the risk of cancer and cardiovascular diseases. The Mediterranean diet is rich in plants and their nutrional and nonnutrional substances have healthful qualities. That is why, in the early 1960s,

most people contrasted this diet with the northern European diet (Ferro-Luzzi and Sette, 1989).

At that time, the consumers from the Mediterranean countries of Europe ate more cereals, rice, fruits, vegetables and vegetable oils, and less meat, milk and dairy products, animal fats and sugar than the northern Europeans. We have found a slow but progressive convergence in the dietary habits of northern and southern Europeans that is characterized by eating fewer cereals and more animal products, especially meat, milk, and eggs in the Mediterranean countries, and by eating more fruits, vegetables, and vegetable oils in the northern countries. These results confirm that the dietary patterns have changed in both groups of countries in such a way that the Mediterranean diet has now become "westernized" and the northern diet is becoming more like the southern, although both retain some individual characteristics.

Apart from these similarities in diets, consumer reactions to changes in income and prices still differ in most cases. A food demand system has been estimated for some selected southern and northern European countries and differences in consumer reactions have been tested. Results indicate that Spanish consumers react differently to price and income changes than Danish, French, and British consumers. However, the average shares of food products are quite similar between Spain and Great Britain, and Spanish and Italian consumers react in the same way to changes in income (via food expenditures).

On the other hand, consumers in all the countries show the same dynamic behaviour because an autoregressive specification is accepted for all of them. It means that some inertia in food consumption behaviour exists, but no dietary habits have been found. This result was expected because of the slow, but progressive convergence in dietary habits.

As mentioned above, Spanish and Italian consumers react in the same way to income changes. Meat elasticities in those countries are greater than unity, so consumption increases more than proportionally to changes in food expenditures. However, the relative consumption of other products varies less than proportionally; and in particular for cereals, milk, and oils. In the other countries, meat elasticities are also greater than unity with the exception of France. On the other hand, the French elasticity for fish is the only one greater than one as France has the highest share for meat expenditures among the countries included in this study. However, this share has decreased in the last few years, while the share for fish has increased remarkably (by 25% in the last 20 years). As incomes increase, french consumers tend to buy relatively less meat and more fish. This trend is just the opposite in the remaining countries. Thus, these countries are potential meat markets while France is a potential fish market. Moreover, meat consumption responds more to own-price changes than fish consumption does, so retail price strategies will become more important in meat markets.

Milk and eggs income elasticities are elastic in Denmark and France, the countries in which the increase in the share of expenditures for milk were observed as more important. Also, in these countries, price elasticities are higher than in the rest, although in this case, all are inelastic. Therefore, Denmark and France still offer market opportunities for milk and eggs producers. In the other countries, the market seems to be saturated.

The income and price elasticities for cereals are inelastic, and are generally less than 0.6. Thus, the cereals market is saturated, and the relative proportion of the budget allocated to these products is losing importance as part of total food expenditures. Therefore, producers and distribution channels must diversify products in order to find a place in the market. The level of aggregation in fruits and vegetables and fats (both animal and vegetable) does not permit further analysis, and more disaggregated data is needed to ensure that the conclusions have some value for decision makers.

This study shows that, in spite of the level of aggregation used, it is impossible to talk about a homogeneous European consumer. National food traditions and cultures still play an important role in consumer behavior, which can not be fully explained by economic variables, such as, income and prices. Although a common trend seems to exist in the long-run, marketers at the European level might have market opportunities and possibilities to implement differentiated marketing strategies, even with similar products across European countries. However, further research is needed at a more disaggregated level. The lack of homogeneous data is the greatest limitation; thus, joint efforts must be made to establish a European food consumption database in order to facilitate furher comparisons across European countries.

Notes

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[4] Estimation results are available from authors upon request.

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Agricultural Marketing and Consumer Behavior in a Changing World

Berend Wierenga
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Klaus Grunert
Jan-Benedict E.M. Steenkamp
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As in many other sectors, in agribusiness major changes are taking place. On the demand side, consumers are changing lifestyles, eating and shopping habits, and increasingly are demanding more accommodation to these needs at the supermarket. With regard to the supply: the traditional distribution channel dominators–manufacturers of branded consumer products—are trying hard to defend their positions against retailers, who gather and use information about the consumer to streamline their enterprises and strengthen their ties with the consumer. The agricultural producers, meanwhile, face increased regulations with regard to food additives, pesticides, and herbicides. Pressures rise as their business becomes more specialized and capital-intensive than that of their predecessors. Finally, the larger political climate is one which is not so favorable to agriculture, which now has to compete in the global market without significant government support.

Agricultural Marketing and Consumer Behavior in a Changing World describes and interprets changes in the domain of agriculture and food. The contributors develop the theme of taking an interdisciplinary approach to coping with these changes, using concepts and methods developed in general marketing, which are adapted to apply to the particular characteristics of the food and agriculture sector.

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