MAPP

SEGMENTATION OF THE INDUSTRIAL MARKET FOR FOOD COMMODITIES

A CONJOINT-STUDY OF PURCHASE OF VEGETABLE OILS IN THE MAYONNAISE- AND MARGARINE INDUSTRIES

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EXECUTIVE SUMMARY

The purpose of this working paper is to study whether current market and technological developments in the vegetable oil industry can be used as the outset for a price and/or quality based segmentation of the major industrial markets for this product. More specifically we want to identify segments with preferences for the qualities of Danish rape seed oil.

The background for the study presented in this paper is the research project *Rape seed oil for human consumption*, which has its offspring in the nutritional qualities of Danish rape seed oil and the technological possibilities of a new gentle processing method. The project is sponsored by the Danish government, and involves a number of research institutions and private companies: The Royal Veterinary and Agricultural University of Denmark, The Technical University of Denmark, the Biotechnological Institute, DLF-Trifolium, Scanola A/S, and the MAPP Centre.

The majority of theoretically-founded segmentation studies in industrial buying behaviour has dealt with large investments or technologically complex products, whereas research in commodities is almost non-existent. Based on the results of a preliminary study, this paper argues that the application of concepts from industrial buying behaviour to the study of commodity buying, such as the procurement of vegetable oil, is an appropriate outset, when trying to segment the market for such commodities.

The article begins with a brief discussion of why food commodity markets should be segmented, then follows current developments in the demand and technology conditions on the market for vegetable oil. Later we discuss how concepts from industrial buying behaviour can add to the understanding of commodity buying and segmentation. Following this a conjoint model of vegetable oil procurement in the vegetable fats and mayonnaise industry in Denmark, Sweden, Germany, Switzerland and the United Kingdom is developed and implemented. Finally, the results and the implications of the study are discussed.

The most important finding from the study is that the price criterion is always of major importance when buying vegetable oil in the vegetable fats and mayonnaise industry, but that it is possible to identify segments of companies with different preferences as regards the characteristics of vegetable oils and supplier services.

1. INTRODUCTION

– why and how to segment the market for a food commodity?

At first glance the title of this paper appears to be a contradiction in terms. Segmentation of the market for a commodity, ie a standard product sold at stock exchange prices – how is that possible, and why should one bother? But a food commodity is not a commodity per se. It has become a commodity, because powerful actors in the channel wanted it that way and because technological development made it possible. This also means that the occurrence of new aspects of demand and/or technology potentially can be used as the outset for segmenting the market for a food commodity.

The industrial market for vegetable oil is currently characterised by the appearance of changing demands and technological opportunities, pointing in the direction of gentle processing and better nutritional qualities (Cogels, 1995). In Denmark, a scientific research programme[1] has documented the positive nutritional qualities of rape seed oil (Larsen & Pedersen, 1996; Jeppesen, 1998), and developed a "thin film" refining method, which is gentler than traditional refining (Jacobsen, 1996). The practical purpose of the study presented in this paper is to assess whether Danish rape seed oil can be differentiated from other types of oils on the industrial commodity market.

On a commodity market the price is the decisive criterion for choosing among products and suppliers. From a supplier perspective this could be taken as a supportive argument for complacency. But one could also argue that the determinant importance of the price criterion for all or most buyers on the market, makes it even more important to look for other sources of differentiation. According to the theories of industrial buying behaviour (see eg Johnston & Lewin, 1994), such other sources could either be related to the characteristics of the buyers, the suppliers or the products sold.

The research in industrial buying behaviour has until now focused on the buying of complex products and investments (Johnston & Lewin, 1994). There can be no doubt that the buying of commodities compared to the buying of more complex industrial products lends itself more easily to micro-economic modelling. The academic purpose of the study presented in this paper is to study whether the concepts developed in the area of industrial buying behaviour can add to the micro-economic understanding of commodity purchasing behaviour, and segmentation of commodity markets.

In the micro-economic research area, the possibilities for segmenting commodity markets was recognised already by Chamberlin (1933) when he described two basic types of differentiation (horizontal and vertical). Horizontal differentiation concerns goods which are perfectly homogeneous, but which can be differentiated because of differences in factors surrounding the sale, eg terms of trade and seller-buyer relationships. Lancaster (1979) focused on horizontal differentiation in his description of different kinds of consumer market structures.

1 The project *Rape seed oil for human consumption* administrated by the Biotechnological Institute, Kolding, Denmark

Compared to consumer markets, the possibilities of horizontal differentiation on industrial markets must in general be expected to be at least as good because of the inherent importance of relationships, reliability, delivery terms etc. In the following such factors will be referred to as “supplier variables”.

The vertical type of differentiation concerns variance in the qualities of the commodity. According to Lord (1989) even the markets for food commodities (eg cocoa, wheat, beef and sugar) are characterised by a certain influence of heterogeneous preferences concerning product qualities (labelled product variables in the following).

Whereas the possibility for commodity differentiation based on supplier and product variables is identified by economists (eg Chamberlin, 1933; Lancaster, 1979), the micro-economic differentiation research is based on historical data and the estimation of the economic consequences of such variables, for example in the form of “switching costs” and “adjusted prices”. For practical matters, ie when developing actual differentiation strategies, neither the use of historical data, nor the encroaching of nominal product and supplier variables into price terms is satisfactory. Because of this we chose to base our study on experimental data and on the theories of industrial buying behaviour.

Although industrial segmentation studies, which are founded on theories of buying behaviour, are less frequent than similar consumer market studies, a number of publications can be mentioned, eg Bonoma & Shapiro, 1983 and Robertson & Barich 1992. As regards industrial commodities Rangan, Moriarty and Schwartz (1992) report a study of the segmentation of the steel strapping market, but to our knowledge the theories of industrial buying behaviour has so far not been used as the foundation of any studies concerning the segmentation and differentiation of food commodities.

Section 2 of this paper describes the results of a preliminary study (Bech-Larsen & Skytte, in press) of a number of characteristics and current developments with possible implications for the segmentation of the market for an important food commodity, ie vegetable oil.

Section 3 describes an attempt to develop a framework for the study of industrial buying of food commodities. The purpose is to identify the theoretical models and constructs which are most relevant to the industrial buying of commodities.

Section 4 describes the conjoint-based study design, which is used to implement the framework developed in section 3, and section 5 describes the main results of the study.

Finally, in section 6, the implications for the study of commodity buying behaviour and the management implications are discussed.

2. DEVELOPMENTS ON THE INDUSTRIAL MARKETS FOR VEGETABLE OIL

As discussed in section 1, we chose to use the industrial market for vegetable oil as the outset for our study, because it is characterised by the appearance of changing demands and technological opportunities, which potentially can lead to differentiation possibilities. Because vegetable oil is used as an ingredient in 70% of all processed foods (Cogels, 1995), we chose only to focus on the procurement of the vegetable fats and mayonnaise industries, which are two of the heaviest consumers of vegetable oil (Bech-Larsen & Skytte, in press). The catering and bakery industries are other large oil consumers, but because these industries require different qualities of oil, for example regarding temperature resistance and because they represent levels further downstream in the vertical distribution system (Bech-Larsen & Skytte, in press), we chose to concentrate on the vegetable fats and mayonnaise industries, which buy directly from the processors of vegetable oil. Vegetable fat is defined as hard or liquid vegetable margarine, butter/vegetable fat mixtures and bottled vegetable oil. Mayonnaise is defined as mayonnaise, and mayonnaise-based dressings, sauces and salads.

The current conditions for the marketing of vegetable oils is to a large degree determined by the international soybean trade (European Commission, 1995). The soy bean trade is also mentioned as an area where the quality and behavioural aspects of industrial purchase – compared to the economic aspects – are less relevant (Stern & Reve, 1980).

Soybeans – as well as other sources of vegetable oil – were not always commodities, however. According to Bush (1996) originally American soy beans were a very differentiated class of products. This lasted until the 50s, when systems were implemented to standardise the product and trade, and thus to reduce the transaction costs. As a consequence vegetable oil has become a commodity because technological developments made it possible and because powerful actors in the channel or the environment wanted it that way.

Today rape seed oil, like soy bean oil and most other vegetable oils, is traded as a low-price commodity on the international markets. The practical purpose of our study is to find out whether this is necessarily so. Our aim is to identify: (a) possible sources of product or supplier differentiation of rape seed oil, and (b) segments of food processing companies who have preference for the qualities of Danish rape seed oil.

A preliminary study based on secondary data and expert interviews (Bech-Larsen & Skytte, in press) uncovers a number of trends that enforces the belief that the industrial market for vegetable oil can be segmented on product and/or supplier characteristics. Thus, for a number of reasons, selecting the right type of product and supplier is becoming more important to the companies buying vegetable oil:

- Consumers are increasingly concerned about the health consequences of food; this is particularly true for oils and fats, which are believed to be the main cause of a number of food-related disorders, not to mention obesity. Health concern induces the development of more healthy oils and oil-containing products; this increases the need for stronger collaboration between the oil-producing and consuming companies.

- At the same time consumers' concern about the environmental and ethical consequences of food-production increases. This development is reinforced by the market appearance of genetically modified oilseeds. A trustworthy policy on behalf of the food-producer implies that it is necessary to keep track of the products from field to table; and consequently an increased importance of supplier selection.

- Public authorities in Denmark and other Scandinavian countries have urged the food industry to produce oils and fats which minimise the content of transfatty acids. As this implies process and product development, it increases the importance of supplier selection, ie the selection of a supplier with competencies in co-operation and research.

- The global overcapacity in the vegetable oil-producing sector will cause many oil crushers and refineries to close down in the next few years (Cogels, 1995). Together with the expected scarcity of oil seeds and beans, resulting from farmers world-wide changing to the more lucrative wheat production (European Commission, 1995), this will increase the importance of supplier selection and supplier-customer relations.

- New crushing and refining technology enables the production of oils without the harsh treatment involved in conventional processing. In this way, the original qualities of the raw material can be sustained and less harm is done to the environment.

3. A FRAMEWORK FOR THE INDUSTRIAL BUYING OF FOOD COMMODITIES

As discussed in section 1, the micro-economic models are insufficient to our purposes. Instead we chose to base our study on the models of industrial buying (Robinson, Faris & Wind, 1967; Webster & Wind, 1972; Sheth, 1973), which contains behavioural as well as economic elements.

As the application industrial buying behaviour models to the study of commodity buying so far has been non-existent, a note on the state-of-the-art of these models is necessary. The purpose is to identify models and constructs which are most relevant to the analysis of industrial buying of commodities.

In 1967, Robinson, Faris and Wind developed a descriptive model of industrial buying as consisting of eight 'buy phases' (recognition of needs, determination of characteristics and quantity, description of characteristics and quantity, search for potential sources, acquisition and analysis proposals, evaluation proposals and selecting suppliers, selecting an order routine, performance feedback and evaluation). The relative importance of the eight phases varies in relation to the 'buy task' (new buy, modified rebuy or straight rebuy). This work was followed up by Webster and Wind (1972), who introduced the concept of a 'buying centre', including five distinct roles (users, influencers, buyers, deciders, gatekeepers). Furthermore, the buying behaviour in their model is analysed as a function of four levels of determinant variables (a personal level, an interpersonal level, an organisational level, an environmental level). In 1973 Sheth published his now classic article *A Model of Industrial Buyer Behavior*, in which he described the various conflict/negotiation mechanisms at the interpersonal level.

Johnston and Lewin (1994, p. 3), who recently reviewed and integrated much of the research on organisational buying behaviour, concluded that ....*after twenty-five years of empirical testing, it appears that these models (referring to the models above) were correct in proposing that environmental, organisational, group, participant, purchase, seller, informational and conflict/negotiation characteristics, as well as the stages in the buying process, significantly affect organisational buying behavior.*

The high complexity of many of the models of industrial buying behaviour, which have appeared since the late 1960s, is due to the fact that the industrial buying process is often multi-phase, multi-person, multi-departmental, and multi-objective (Möller, 1985; Johnston & Lewin, 1994). As will become clear from the discussion below, we contend that this complexity can be reduced in the case of industrial buying of commodities. Thus, we believe that the constructs contained in the pioneering model of Robinson, Faris and Wind (1967), together with the environmental and organisational levels of analysis, which were introduced by Webster and Wind (1972), yield a comprehensive description of industrial buying of food commodities.

The eight buy phases described by Robinson, Faris and Wind (see above) basically describe two central aspects: (a) the specification of product criteria and (b) the selection of supplier. These two sets of criteria parallels the micro-economic definition of vertical and horizontal differentiation criteria discussed in section 1. The use of this dichotomy is also in accordance with Wagner, Ettenson and Parrish (1989) who recommend that the study of product and supplier criteria in organisational buying behaviour be divided. It must be recognised, however, that the empirical validity of the dichotomy of product and supplier selection is questionable – to a certain degree, product and supplier selection always interact. Notwithstanding this, the interaction must be expected to be less pronounced for commodities than in the case of more complex industrial products.

The relative importance and degree of interaction between product and supplier selection must be expected to be related to the buy task. In a 'new buy' situation, where the buyer's product knowledge is scarce, the supplier selection can be relatively more important than in the case of 'modified rebuy', where the buyer has a considerable knowledge of the product in question. On the other hand, the 'new buy' product is often introduced to the potential customer by a particular supplier, whereas a 'modified rebuy' often involves an active search for new suppliers.

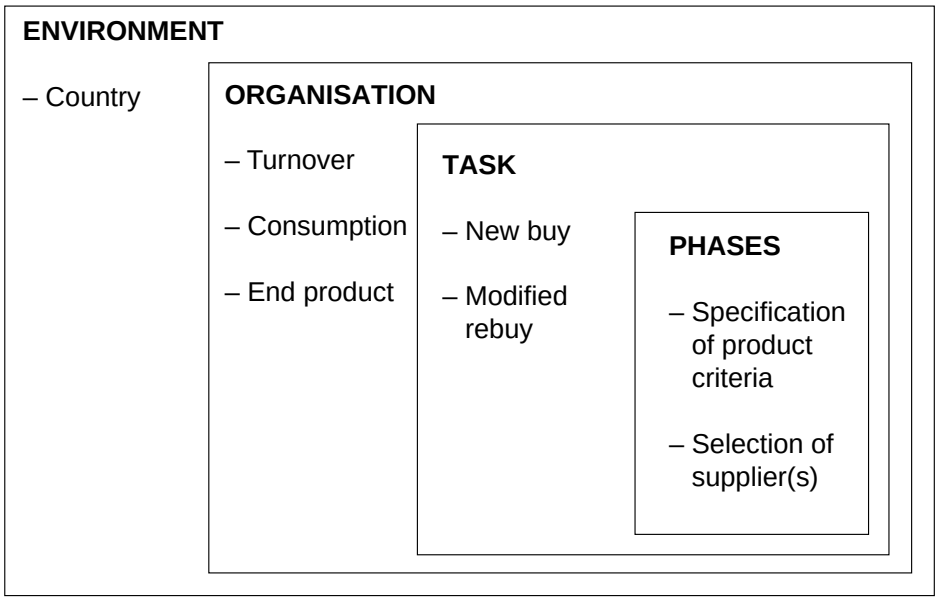
According to Webster and Wind's model (1972), industrial buying behaviour should be analysed as a function of four levels of variables: a personal level, an interpersonal level, an organisational level and an environmental level. As discussed, we have chosen to exclude the personal and interpersonal levels from the framework. The exclusion is based on a preliminary analysis (Bech-Larsen & Skytte, in press) which contends that although various people (production managers, marketing managers etc.) may be involved in establishing the specifications for a food commodity, eg vegetable oil, the buying manager makes the final decision on his own. And furthermore that the standardised trade norms applying to food commodities makes the personal and interpersonal variables less important than environmental and organisational variables.

In section 2 a number of environmental developments concerning technology, supply and public policy were discussed briefly. Because vegetable oil is traded as an international commodity these developments do indeed influence a company in the oils and fats industry, no matter the home country of the company. However, as there are national differences in environmental variables (eg differences in public health legislation and climatic conditions), we operate with the home country of the buying company as an environmental variable.

With regard to the organisational level, our preliminary study (Bech-Larsen & Skytte, in press) indicated that the procedures and criteria involved in industrial buying of vegetable oil is a function of company size (annual turnover and consumption of vegetable oil) and type of end product (ie which technological requirements are induced by the end product).

The framework in figure 1 illustrates the essence of the discussion above. The words in capital illustrate the different levels of variables believed to influence which product and supplier criteria are involved when professional buyers in the food industry are buying food commodities.

Figure 1. A framework for industrial procurement of food commodities



4. Design and implementation of the study

As discussed above, the purpose of the study is: to analyse whether the concepts developed in the area of industrial buying behaviour can add to the understanding of commodity market segmentation, by trying to identify segments of food processing companies that are willing to pay a premium for the qualities of Danish rape seed oil, as developed and documented in connection with the research project *rape seed oil for human consumption*.

The study will focus on selecting vegetable oils and suppliers of these products. In consumer behaviour research such tasks are often studied by means of conjoint analysis (Green & Rao, 1971). This is not as common in research on industrial buying behaviour, but as it will become clear from the discussion below, the use of conjoint analysis is expedient to our purposes.

According to Green and Krieger (1996), one of the difficulties in using conjoint analysis when studying industrial buying behaviour is that the number of relevant variables is considerably larger than in the case of consumer products. When many variables are to be studied in a conjoint analysis, it is possible to use either hybrid models or bridged designs, where two conjoint tasks can be linked by a common variable. Hybrid models integrate the de-compository estimation of attribute utility of traditional conjoint analysis, with respondent evaluations of single attributes (compository estimation). We chose to use the bridging alternative, because this allows us to study the supplier and product selection independently, and at the same time to study the relative importance of the criteria involved in these two selection tasks. Furthermore, bridging is less demanding on the respondents than the use of hybrid models. In each of the three tasks the respondent was asked to evaluate the probability to buy/contract a number of full-profile descriptions of a product (tasks 1 and 3) or supplier task 2).

The basis of our study is a bridged conjoint design interlinking three preference ranking tasks. In the first task, the respondent was presented with a number of descriptions of vegetable oils that varied on a number of attributes, which we knew from a preliminary study to be important to industrial buyers of vegetable oil.

In the second task, the respondent was asked to rank a number of descriptions of suppliers, which all supply the oil most preferred (as stipulated by the respondent in the first task), and which also varied on a number of important dimensions identified in the preliminary study (Bech-Larsen & Skytte, in press).

In the third and final task, the respondent was asked to rank a number of descriptions of rape seed oil, which varied on a number of attributes directly related to the technological results of the project *rape seed oil for human consumption*. These results are mainly related to the development of a new and gentle refining technology, ie thin film refining (Jacobsen, 1996), and the documentation of the nutritional qualities of Danish rape seed oil (Larsen & Pedersen, 1996; Jeppesen, 1998).

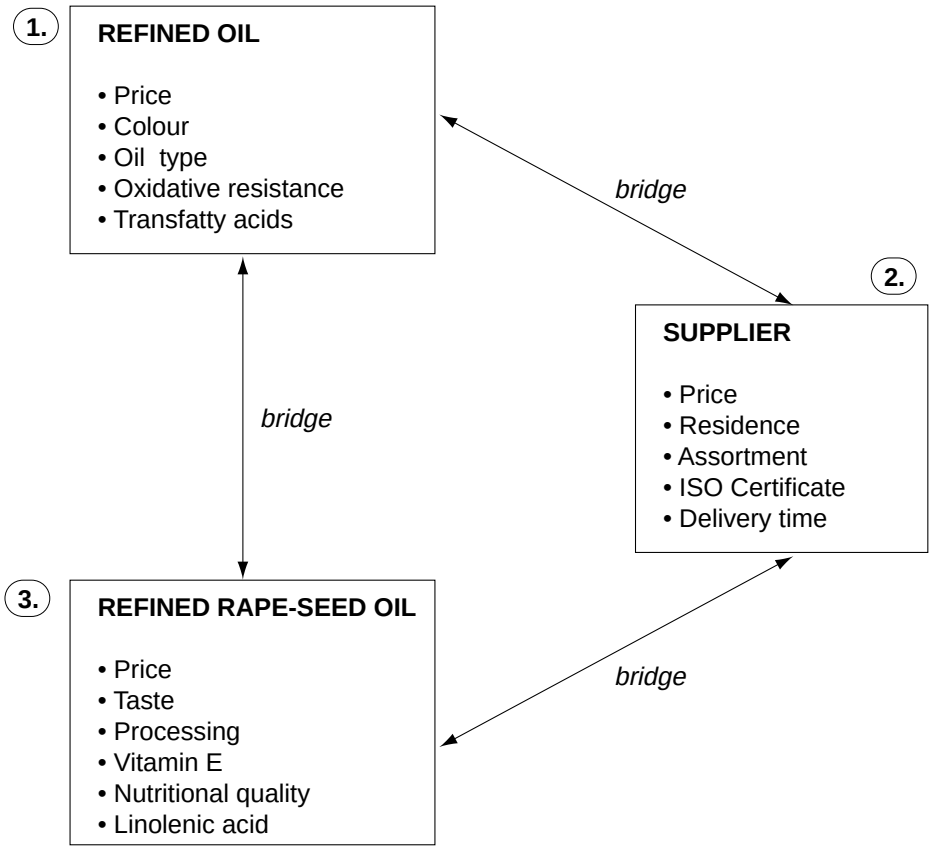
As discussed in section 2 we wanted to include the buy-task as a background variable in the study. This was done by looking at the responding companies' experience with buying rape seed oil. Because many companies in the oils and fats sector substitute different oil-types, and because the qualities of vegetable oil are constantly being improved (Bech-Larsen & Skytte, in press), there is no exact way to differentiate between a 'new buy' and a 'modified rebuy' situation. We have chosen to base the operationalisation of the buy-task variable on the current consumption of rape seed oil. Thus, if currently the companies mainly use rape seed oil, the offer to buy a new type of Danish rape seed oil (as in conjoint task 3) is classified as a modified rebuy situation. For the group of companies not using rape seed oil as their main source, the last task was characterised as a 'new buy' situation.

The use of the price variable in all three tasks, together with the specifications that (a) all the oils in the first task have average performances on the variables used in the third task, and (b) that all of the suppliers in the second task supply the oil most preferred by the individual respondent, and that all of the rape seed oils in the third task are supplied by the preferred supplier, and that they have average performances on the variables used in the first task, allows us to bridge task 1 with task 3, as well as 2 with 1 and 2 with 3.

As the preliminary study (Bech-Larsen & Skytte, in press) indicated that price was the dominant criterion when buying vegetable oils, we chose to disregard the recommendation to use more than one bridging variable (Green & Krieger, 1996), and to operate with price as the only bridging variable.

Figure 2 illustrates the study design and the attributes to be used in the study.

Figure 2. Design of the bridged conjoint study



The indication (Bech-Larsen & Skytte, in press) that price is the dominant decision criterion and the fact that standardised trade norms apply to most types of vegetable oil makes it expedient to implement a design without interaction between price and the other variables. Similarly the number of variables to be included in the study makes it inexpedient to include other interaction measures in the design.

To further reduce the complexity of the design, the variables were measured at only two levels, except *price* which was measured at three levels. To counteract the limitations of this design we used the products mainly used by each respondent and the prices of these products as reference points, ie for the variables *oil type* and *price* one of the levels referred to the vegetable oil mainly used by the respondent. In this way we achieved a greater variation in oil types and prices than would otherwise have been the case. At the same time this design should improve the "authenticity" of the data collection situation, and thus contribute positively to the validity of the results of the study.

The operationalisation of the price variable was essential to the success of the study. An operationalisation with large differences between the levels of the price variable would imply that this variable would account for all of the variance in the data. An operationalisation with small differences would imply that respondents would be indifferent as regards the price variable. This would invalidate the bridging procedure and in the case of total indifference (zero difference in utility level for the price levels) make it impossible. Having consulted a number of industry experts, we chose to operationalise the price variable with relatively small differences, ie average price on oil mainly used +/- 5%. Below the operationalisation of the levels of the other variables involved in the study are listed.

TASK 1

Colour	**Oil-type**	**Oxidative resistance**	**Content of trans-fatty acid**
a) Colour	a) Mainly used	a) 20 hours	a) < 2.5%
b) Clear	b) Rape seed	b) 15 hours	b) < 0.5%

TASK 2

Residence	**Assortment**	**Certification**	**Time of delivery**
a) Permanently represented in buyer country	a) Rape seed & sunflower only	a) ISO 9000	a) < 2 days
b) Non-resident	b) Full assortment of vegetable oils	b) None	b) 2-7 days

TASK 3

Taste	Processing	Content of Vitamin E	Nutritional quality	Content of Linolenic acids
a) Neutral	a) Gentle crushing and refining	a) 900 ppm	a) Best available	a) 4 %
b) Slightly nutty	b) Conven-tional	b) 600 ppm	b) Average	b) 9%

The selection of the variables to be included in the study and the operationalisations of these, are based on preliminary interviews with industry experts (tasks 1 and 2), as well as discussions with the other participants in the research project *Rape seed for human nutrition* (task 3). A discussion of the technical implications of the variables included is outside the limits of this paper, but because the research project is based on the superior nutritional qualities of rape seed oil, a brief note of some of the potential health implications of the product variables should be given: A high content of transfatty acids are believed to increase the risk of different forms of cancer. As mentioned, the Danish government therefore has laid down that the content of transfatty acids be minimised. The content of vitamin E is positively related to the ability to accumulate calcium in the human body and the content of linolenic acids is believed to be positively related to the digestion of oils and fats.

5. RESULTS

The study was implemented in Denmark, Sweden, Germany, the United Kingdom and Switzerland in the second quarter of 1997. The respondents were persons responsible for the procurement of oils in companies producing vegetable fats or mayonnaise. Vegetable fats are defined as hard or liquid vegetable margarine, butter/vegetable fats mixture and bottled vegetable oil. Mayonnaise is defined as mayonnaise, and mayonnaise-based dressings, sauces and salads. Only companies with a yearly turnover above equivalents of DKK 25m were included in the study. Care was taken to identify the person with the main responsibility for the procurement of vegetable oil. The respondents were contacted by phone and interviewed on a face-to-face basis.

Based on secondary data, official statistics etc. we estimated the population to be 160 companies (margarine and mayonnaise producing facilities with independent purchase competence). Below, the number of contacted companies with independent purchase competence, the numbers of completed interviews, as well as the number of interviews included in the different parts of our analysis are outlined.

Individual conjoint utility functions were estimated for the 108 respondents interviewed. Seventeen cases had to be left out because the respondents were inconsistent as to the ranking of product descriptions in at least one of the three sets of product descriptions (poor regression fits). Because two respondents were inconsistent as to the importance of the price variable (poor bridging fit) in at

least two of the three sets of product descriptions, we also had to exclude those respondents from the analysis. As the remaining 89 respondents had heterogeneous preferences as to the importance and preferred levels of the included variables, we chose to conduct a cluster analysis with the aim of identifying more homogeneous segments of respondents. Five out of the 89 respondents had very different preferences, which is why we chose to exclude them from further analyses.

Number of companies contacted	139
Number of refusals	31
Number of interviews conducted	108
Cases left out because of poor regression fit (Adj. $R^2 < 0.3$)	17
Cases left out because of poor bridging fit (Scale factor < 0.3)	2
Outliers in the clustering analysis	5
Cases available for utility segmentation	84

The outliers were analysed on an individual basis. Most of these companies were small German producers of mayonnaise. The total number of interviews and the 84 cases available for utility segmentation were distributed across the countries as:

Denmark	10	8
Sweden	13	11
Germany	55	43
The United Kingdom	17	14
Switzerland	13	8
	108	84

Table 1 outlines the distribution of the 108 companies, which took part in the study with regard to the oil types mainly used. From this table it is clear that rape seed, soy bean and sunflower are the preferred raw materials in the margarine and mayonnaise industry. 52% of the 108 companies used mainly rape seed oil. 22% of the companies only produced vegetable fats, 48% only produced mayonnaise, whereas 15% of the companies produced both kind of products.

Table 1. Number of companies mainly using each oil type and number of companies where each oil type covers 50% or more of the total procurement of vegetable oil

Oil type	Number mainly using	Number cover 50% or more
Soy bean	21	21
Palm	7	5
Rape seed	55	41
Grape seed	2	4
Corn	1	2
Sunflower	16	15
Olive	1	1
Other	4	4
Missing	1	
Total	108	93

Acknowledging the importance of the price variable when industrial customers buy food commodities, we split the analysis into two parts: concerning differences in price sensitivity and concerning differences in preferences for a number of product and supplier-related criteria. Below we first discuss the results concerning the price variable. More specifically, we want to analyse whether the importance of the price variable differ among the three designs and among segments of industrial buyers of vegetable oil.

5.1 The importance and sensitivity of the price variable

First we look at the distribution of price preferences and average relative importance of price in the three tasks. As can be seen from table 2, the average relative importance of the price variable amounts to more than 40% in all three tasks. As the average relative importance of all the variables included in each of the three tasks sums to 100%, the accumulated relative importance of the other variables (4 in tasks 1 and 2; 5 in task 3) is less than 60%.

In spite of the dominance of the price criterion in all the three tasks, the results also shows that the accumulated effects of the other variables explains a substantial part of the variance in buying intention. This strengthens our belief that it is possible to identify segments with positive preferences of the qualities of Danish rape seed oil.

Table 2. Distribution of price preferences and average relative importance (RI) of price and average adjusted R^2 for the three conjoint tasks

Task	R^2	Average RI of price	Most preferred price level		
			5% cheaper	Price of oil mainly bought	5% more expensive
1	.78	41.0%	74.2%	23.7%	2.1%
2	.75	47.3%	72.6%	26.4%	1.0%
3	.77	48.2%	83.2%	15.9%	0.9%

As is clear from the average adjusted $R^{2,}$ values for all the three tasks are at or above .75, ie the fits of all the three conjoint models are at a satisfactory level.

For each of the three tasks, the results concerning the other variables included in the study are presented in the appendix. For all the other variables, as is the case for the price variable, the distribution of respondents as regards preferred levels, has face validity.

In all three tasks, we found a substantial heterogeneity as regards the importance of the different variables and/or the preferred levels of those variables. This is documented in the appendix, where the average individual relative importance is compared to the group relative importance for all the variables in the study.

Because of the respondent heterogeneity, we performed a cluster analysis (Ward's method) on the utilities of each of the 14 variables in the bridged data set (since the price variable was represented with three levels, 15 variables were used in the clustering task).

Due to the determinant importance of price in all three designs, the bridging was performed without problems. As discussed above, only two cases had to be left out because of lacking consistency as regard the bridging variable.

The first round of iterations in the cluster analysis resulted in five outliers, which were left out. This left us with 84 interviews for the clustering task. Based on the breakpoints in the distance measure a solution with four clusters (preference segments) was selected. As becomes clear from table 3, the four clusters were of uneven size, however.

In table 3 the average relative importance of price variable for each of the four clusters are displayed. By means of one-way anova analysis with cluster membership as the independent variable, we studied whether the clusters differ as regards the relative utilities of the three price levels as the dependent variable (as the relative utilities sum to 1, only two analyses were performed). Although the results presented in table 6 indicate that clusters 2 and 3 tend to be less price sensitive than clusters 1 and 4, no significant differences were found in the utility of the price levels.

Table 3. The average relative importance of the price variable for each of the four clusters

	CLUS1	CLUS2	CLUS3	CLUS4	Total
# respondents	43	6	27	8	84
Price	0.23	0.12	0.15	0.38	0.30

As the average relative importance of all the 14 variables included in the study sums to 1, the accumulated relative importance of the 13 product and supplier variables varies between 0.62 and 0.78 for the four clusters. The average relative importance of each of the 13 product and supplier variables will be discussed in the next section.

Apart from the cluster-based analyses we also performed a number of one-way anova analyses with the background variables (as presented in section 2) as the independent variable and the utility of the price variable as the dependent variable. No significant differences where found, however.

As expected the results show that the price variable is the most important criterion, when choosing among products and suppliers on the commodity market for vegetable oils. But it is remarkable that neither the turnover, the oil consumption nor the type of end product, has any significant relation to the importance of the price variable.

Based on the results discussed above it is safe to conclude that price is the determinant criterion when buying vegetable oil on the industrial market, and that all the buyers in the market are very price sensitive. With the current developments on the market in mind (see section 2) this does not imply that an attempt to segment the market on non-price attributes, such as product and supplier characteristics, is inexpedient. Any segmentation strategy on the industrial market for vegetable oil must, however, apply to strict cost limits.

5.2 Preferences for product and supplier variables

In table 4 the average relative importance of 13 product and supplier variables for each of the four clusters are displayed. The relative importance above .1 are written in bold types. By one-way Anova analysis with cluster belonging as the dependent variable, it was studied whether the clusters differ as regards the utility of the 14 variables.

The utility of rape seed oil compared to the oil currently used by the companies involved in the study was found to be significantly higher for cluster 1 than for cluster 3. For the companies in cluster 1, the utility of a clear oil colour and a low content of transfatty acids (less than 2.5% vs 5%) was significantly higher than for the companies in the other clusters.

For the companies in cluster 3, the negative utility of rape seed oil was significantly larger than for the companies in the other clusters (the utility of rape seed oil was positive for the companies in clusters 1 and 2, see the appendix). Compared to the companies in cluster 3, it also meant significantly less to the other companies that the oxidative resistance of the oil was 15 hours and not 20 hours.

As regards the two small clusters (2 and 4) some additional significant differences were found. Compared to the three other clusters the utility of ISO certification and quick delivery (within 2 days as compared to 2-7 days) was significantly higher for the companies in cluster 2. For the companies in cluster 4 the nutritional quality of the oil was significantly more important than for the companies in the other clusters. As regards the taste of the oil, however, the utility of a neutral taste was significantly higher for the companies in cluster 4 compared to the companies in the three other clusters.

Table 4. The average relative importance of the 14 variables for each of the four clusters

	CLUS1	**CLUS2**	**CLUS3**	**CLUS4**	**Total**
# respondents	43	6	27	8	84
Variables					
Colour	**0.15**	0.00	0.04	0.01	0.03
Oil type	0.05	0.01	**0.23**	0.01	0.06
Oxidative resistance	0.08	0.06	**0.19**	0.03	**0.12**
Content of transfatty acids	**0.31**	0.02	0.07	0.01	0.08
Residence of supplier	0.02	0.08	0.09	0.07	0.02
Assortment	0.03	0.05	0.06	0.03	0.03
Certification	0.02	**0.30**	0.03	0.00	0.08
Delivery time	0.04	**0.31**	0.05	0.05	**0.11**
Taste	0.03	0.02	0.02	**0.21**	0.07
Processing	0.01	0.00	0.01	0.07	0.03
Vitamin E content	0.02	0.01	0.01	0.02	0.01
Nutritional quality	0.01	0.01	0.03	**0.12**	0.05
Content of linolenic acids	0.00	0.01	0.01	0.00	0.00

5. 3 Profiling of clusters by background variables

To assess the correspondence between the utility based cluster solution and the background variables a number of cross tabulations were carried out.

The variables represented in table 5 are similar to the ones described in figure 1, which depicts the conceptual background of the study. As discussed in the previous section, the buy-task variable is operationalised by looking at whether the responding companies mainly are using rape seed oil, or one of the other oil types on the market. If the company mainly is using rape seed oil, the offer to buy a new type of Danish rape seed oil (as in conjoint task 3) is classified as a *modified rebuy* situation; otherwise the offer is classified as a *new buy* situation.

All background variables have been dichotomised so that between 40 and 60% of the observations fell in each group. With regard to the *end product* variable the responding companies were split into a group that only produces mayonnaise and a group of companies only producing vegetable fats or vegetable fats and mayonnaise.

After this the correspondence between the utility-based cluster solution and the dichotomised background variables were assessed by one-way Anova analysis. With a significance criterion of .05, this lead to the following profiles:

Cluster 1. The companies with strong preferences for neutral colours and a low content of transfatty acids are typically Danish or Swedish, and have a higher than average turnover and consumption of vegetable oil.

Cluster 2. This cluster represents companies with a strong focus on supplier variables, ie with strong preferences for quick delivery and ISO certification. The few companies in this cluster are predominantly Swedish.

Cluster 3. The companies with a strong preference for a high oxidative resistance and antipathy for rape seed oil are typically German mayonnaise producers that do not use rape seed as their main source of oil. Their turnover and consumption of vegetable oil is lower than average.

Cluster 4. The few companies with strong preferences for neutral taste and a high nutritional value are typically German; they have a higher than average turnover, but a smaller than average oil consumption, and many of them do not produce mayonnaise products.

Table 5. Distribution of background variables across clusters in percent

	CLUS1	CLUS2	CLUS3	CLUS4
Main use = rape seed (49.4%)	63.4	60.0	25.9	50.0
Turnover above DKK 100m, (62.3 %)	76.3	50.0	40.0	75.0
Vegetable oil consumption above DKK 2.5m, (44.3%)	60.5	60.0	19.2	37.5
Mayonnaise producers only (60.1%)	57.1	50.0	73.1	42.9
Home country				
Denmark (9.5%)	14.0	0	3.7	12.5
Sweden (11.9%)	18.6	33.3	0	0
Germany (51.2%)	37.1	33.3	77.8	50.0
The UK (15.9%)	14.0	33.4	14.8	12.5
Switzerland (11.9%)	16.3	0	3.7	25.0
	100	100	100	100

The proportion of companies mainly using rape seed oil is larger in cluster 1 than in cluster 3. This probably explains why the companies in cluster 1 are more positive towards rape seed oil than the companies in cluster 3. Neither the companies in segment 1 nor the companies in segment 3 are very interested in the characteristics of new Danish rape seed oil (as specified in conjoint task three and documented in table 4). Thus, whereas the results indicate that it is easier to market rape seed oil with previous experience with this product, there is no evidence that experience with conventional rape seed oil improves the probability of acceptance of the new Danish rape seed oil.

Because we asked which oil types that were currently used by the respondent, it was also possible to assess (one-way Anova with oil type currently used as independent variable) the substitutability between different oil types and the utility of rape seed oil as dependent variable. The Anova showed that significant differences exist at the .05 level. The results presented in table 6 illustrate that, although all the respondent companies prefer the oil they mainly use to rape seed oil, the current (main) users of soy bean and palm kernel oil are less negative towards rape seed oil than the other companies.

Table 6. Average individual utilities of rape seed oil for companies mainly using soy bean, palm kernel, corn, sunflower, olive and peanut oil

	Soy bean	**Palm kernels**	**Corn**	**Sun-flower**	**Olive**	**Peanut**
Average individual utility	-0.34	-0.43	-3.38	-1.14	-1.76	-1.18
number of observations	19	5	1	15	1	2

6. CONCLUSIONS AND IMPLICATIONS

The academic purpose of the study presented in this paper was to study whether the concepts developed in the area of industrial buying behaviour can add to the micro-economic understanding of commodity purchasing behaviour and segmentation, as exemplified by the procurement of vegetable oil in the mayonnaise and margarine industries.

From the results presented in the previous section, it is clear that within the limits of the implemented design, the price variable is an omnipotent decision criterion, when vegetable fats and mayonnaise producers buy vegetable oil. Significant differences in preferences for the non-price variables were found, however. Thus, although the results give solid arguments for the validity of univariate price models of commodity markets, they do not render the use of multi-attribute models useless. On the contrary, the results of the study show the necessity of using explicit product and supplier criteria, when segmenting the market for vegetable oil. Furthermore it is possible that even though the price level seems to be fixed in the short run, it may be possible to create stronger relations and bases for product development by segmenting the market and targeting the marketing effort on a set of product and supplier variables. As demonstrated in this paper the theory of industrial buying behaviour can contribute to the selection of which preference and background variables to include in the segmentation research.

Management implications

It is remarkable that neither the type of oil mainly consumed, the turnover, the oil consumption, the type of end product nor the home country of the buyer have any significant influence on the utility of the price variable. Consequently, none of the other variables had a major differentiation effect. Neither colour, assortment, residence of the supplier, method of processing nor the content of vitamin E or linolenic acids differentiate offerings for individual companies or segments (as represented by the cluster solution).

What is even more remarkable, given the market developments described in

section 2, is that almost all companies also were indifferent as regards the overall nutritional qualities of the vegetable oil. Only one of the smallest segments (eight out of 84 companies) has significantly higher preferences for a vegetable oil with the best available nutritional quality.

Based on the fact that vegetable oil is by far the most important input (volume and cost) used in the vegetable fats industry, whereas the mayonnaise industry depends on a number of other ingredients, it could be expected that the latter industry was less price sensitive and perhaps more health conscious. On the other hand it is possible to argue that the vegetable fat industry, because their end-products essentially consist of vegetable oil, would have a greater potential for using oil-based health arguments in their marketing efforts. But as is clear from the results presented in the previous section, the content of transfatty acids is the only health-related attribute that differentiates between the vegetable fats and the mayonnaise industry. This is probably due to the fact that the attention of the public authorities on this characteristic has concentrated on margarine producers. In other words, the health considerations by the vegetable fat industry seem to be driven more by public regulations than by market opportunities.

Having said this, little room is left for commercialisation of the positive qualities of rape seed oil. It is clear from the results, however, that there are companies with positive preferences for the Danish rape seed oil, if it can be sold at prices of competing products. These companies are typically larger than average (with regard to turnover as well as oil consumption), they are Danish or Swedish, and they produce margarine rather than mayonnaise.

Notwithstanding the importance of the price criterion for the current buying of vegetable oil, there are clear indications in the press and in the public debate that nutritional matters are becoming more important. As it must be expected that such market driven developments will influence the downstream functions of a company before the upstream buying functions, further research in the area of differentiation of vegetable oil should therefore be directed at sales and marketing functions in the oil consuming companies.

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APPENDIX: RESULTS OF THE THREE CONJOINT TASKS

Table A1. Distribution of preferences, average relative importance (RI) and group relative importance (GRI) of the variables (except price) in task 1

Colour		**Oil type**		**Oxidative resistance**		**Content of trans-fatty acid**	
	RI 12.5% GRI 3.3		RI 14.7% GRI 8.8		RI 12.6% GRI 16.8		RI 19.1% GRI 14.6
Golden	Clear	Mainly used	rape seed	20 hrs	15 hrs	< 2.5%	<0.5%
42.5%	57.5%	53.2%	46.8%	76.3%	23.7%	38.2%	61.8%

Table A2. Distribution of preferences, average relative importance (RI) and group relative importance (GRI) of the variables (except price) in task 2

Residence		**Assortment**		**Certification**		**Time of delivery**	
	RI 11.0% GRI 9.6		RI 10.6% GRI 0.6		RI 16.7% GRI 15.5		RI 14.2% GRI 16.8
Permanent	Non-resident	Full	rape seed & sunflw.	ISO 9000	None	<2 days	2-7 days
62.7%	37.3%	62.6%	37.4%	76.9%	23.1%	84.7%	15.3%

Table A3. Distribution of preferences, average relative importance (RI) and group relative importance (GRI) of the variables (except price) in task 3

Taste		**Processing**		**Vitamin E**		**Nutritional quality**		**Linolenic acids**	
	RI 25.5% GRI 25.9		RI 12.0% GRI 11.8		RI 3.9% GRI 0.4		RI 5.0% GRI 3.3		RI 5.2% GRI 0.9
Neutral	Slight nutty	Conv.	Gentle	900 ppm	600 ppm	Best avail.	Aver-age	4%	9%
78.7%	21.3%	27.8%	72.3%	45.1%	54.9%	64.9%	35.1%	45.5%	54.5%