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**Sales determinants of  
canned pork products:  
A world-wide study**

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## **Preface**

This report is the outcome of a collaboration project between Tulip International A/S and MAPP. It summarizes what we regard as the scientific outcome of the project. The practical outcome has been documented in other ways and is not available to the public. For reasons of confidentiality, a number of details, notably the concrete description of the products investigated, have been omitted from the report.

We would like to take this opportunity to thank Tulip International A/S, and especially marketing director Bjarne Dahl, for a very fruitful and constructive cooperation.

*The authors  
Aarhus, July 1994*

## **Executive summary**

1. When a set of products is exported to many different countries, these products will probably be in different stages of their life cycles in the various countries, and in addition the life cycles of various products may be lagged to each other. In such a situation, understanding the forces which move a product through its life cycle is important for decisions about when to withdraw from or enter a market, when to transfer a product from one country to another, and also with regard to obtaining economies of scale and scope by grouping countries where the life cycle position is similar.

2. The main factors affecting sales of a canned pork product on a by-country basis are a) economic and socio-demographic factors: income, employment, importance of agricultural sector, education, household size, ownership of household appliances, urbanisation, age of population, b) cultural factors: religion, attitude towards meat, pork, and canned pork, usage of product, c) distributional factors: retail structure, outlet characteristics, possibilities for transporting fresh meat, d) competitive factors: primary and secondary competition, tariffs.

3. Information about these factors is not generally available from official statistics and other secondary sources, rendering a primary data collection necessary. In the present study, data about these factors was collected for a set of 26 countries.

4. Data analysis showed that, by using appropriate models, about 70% of the variation in sales of canned pork products can be explained by a subset of the factors named above. The models have been implemented in a software package that allows on-line simulations of the future development of sales for these products as a consequences of assumptions about changes in the factors determining sales.

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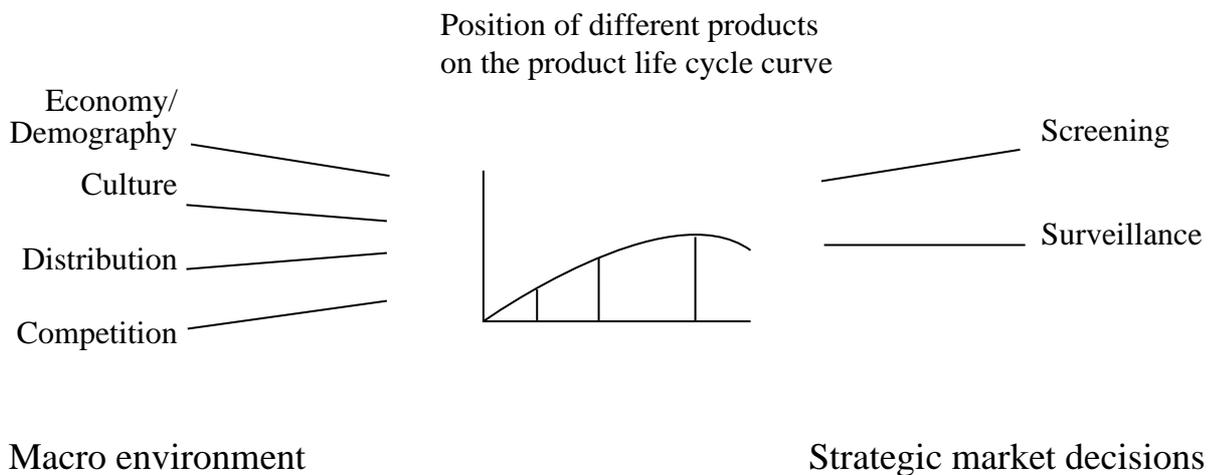
# 1. Introduction and purpose of the study

Danish canned pork products are exported to the whole world. However, in many of the export markets, the life cycle of these products seems to come to a close, as mirrored by declining sales, emerging competition from local producers even in the third world, and a general trend towards ecological and fresh products. This has resulted in an increased need for market information enabling the prediction of the future development of sales in various markets. Such information could be used to

- carry out a more qualified screening of markets with regard to their potential for existing or new products; a concentration of marketing efforts for existing products on those markets, where these products can be expected to continue to grow for some time, would generate resources that can be used to develop new products for those markets where the current products are in decline;
- anticipate in due time when a product group can be transferred from one country to another, and foresee where and when product innovations will be required;
- utilise economies of scale and scope by grouping countries based on common sales-relevant characteristics.

The development of the sales of a product over time can be described by the life cycle concept, and the differences in sales on various markets can be described by the concept of lagged life cycles. However, life cycle models are no causal explanation of sales, they merely summarise how various factors - economic and demographic ones, culture, distribution, competition - influence sales over time, or, put in another way, how the changes over time in other factors determine sales.

Figure 1. Basic framework



Using the concept of lagged life cycles as a theoretical base, the purpose of the present project was therefore to identify factors that have a potential influence on the development of the sales of canned pork products over time, collect data on these factors on a world-wide basis, and estimate a model that relates these factors to sales volume. This model could then be used to predict the future development of sales, based on assumptions about the development of the sales determinants. The overall rationale of the project is visualised in Figure 1.

In the following, the theoretical base of the study will be elaborated on. Then possible sales determinants will be discussed, the plan and implementation of the overall research process will be presented, and the results of the analysis and the models estimated examined.

## **2. Life cycle theory**

This section discusses the product life cycle concept and related theories, which form the theoretical basis of the present study. The life cycle concept actually has two distinct theoretical sources: theories of foreign trade have led to the development of the *international product life cycle*, and theories of diffusion have led to the *product life cycle theory* commonly known in marketing. Both theoretical sources are of potential value in the present study and will therefore be discussed. It will be concluded that the life cycle concept is most useful as a framework for understanding the factors responsible for market evolution.

### **The international product life cycle**

Two quite similar theories, both concerned with the development of production and trade over time, have led to the concept of the international product life cycle: the *theory of technological differences* between countries and the *theory of lagged goods* (Kjeldsen-Kragh, 1977).

In its original version the theory of lagged goods dealt with trade between countries at varying levels of development (Vernon, 1966). The theory of technological differences emphasises trade between countries at the same level of development. It emphasises production and especially the economies of scale enjoyed by first movers when introducing their products. It emphasises the advantages producers obtain by being first on a market, and uses the technological level of an industry to explain the development over time (Kjeldsen-Kragh, 1977).

These models of international trade cycles have emerged into the international product life cycle (Hirsch, 1976; Vernon, 1966; Wells, 1969). The theory divides the development of the trade cycle into five phases, beginning with a firm in a developed country, having a new product, deciding to establish business abroad. Other advanced nations, having equal technological possibilities, soon decide to start their own production, and at a later stage the less developed countries (LDC's) do the same. Efficiency/comparative advantages shift from industrial nations to the LDC's. Normally this shift in comparative advantages of nations is triggered by lower costs in the LDC's. Eventually, the advanced nations, no longer cost effective, import products from their former customers. Seen from a balance-of-payments point of view, the advanced nations fall victim to their own invention.

The trade cycle theories stem from a production-oriented paradigm. They have been criticised for not being able to sort out the various determinants of trade adequately (Cheng, 1984). Wells (1969) acknowledged that it was unlikely that supply-oriented models could adequately explain the export of consumer goods.

The managerial implications of the international product life cycle are rather unclear (Onkvisit & Shaw, 1993). However, the theory draws attention to some fundamental aspects of the diffusion of products on the global market. Usually products are introduced in the home market by the inventor/innovator and then, as competition grows, exported to other markets. The choice of export markets based on criteria like economic attractiveness or mental distance has been analysed by theories of the internationalisation process (eg Johanson & Vahlne, 1990).

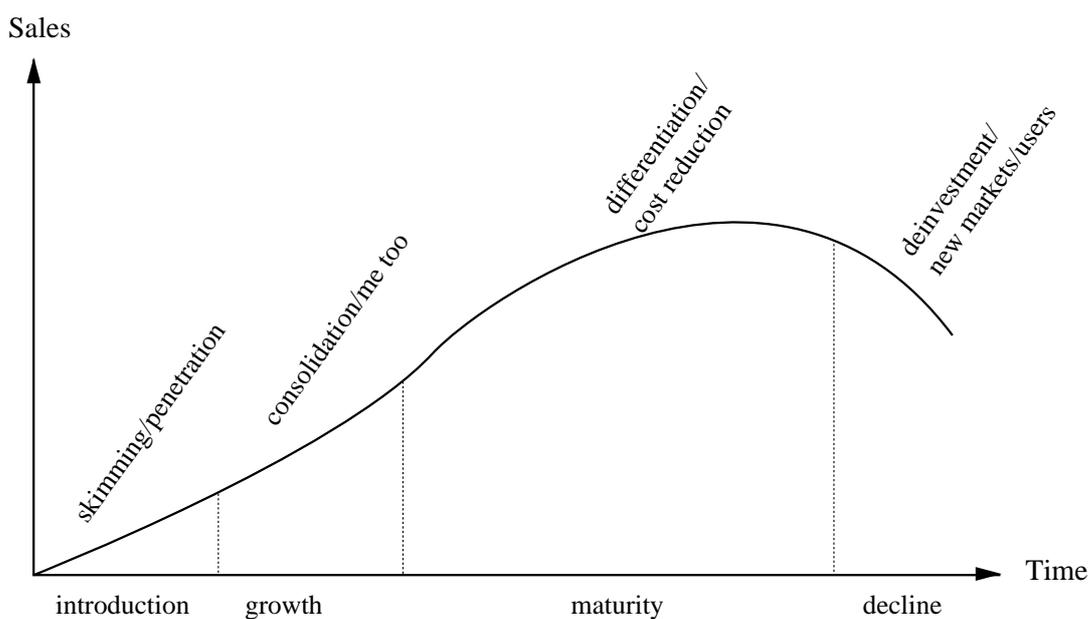
**Product life cycle theory in marketing**

The product life cycle (PLC) concept usually employed in marketing is derived from work on the diffusion process (Bass, 1969), and is therefore more demand (and less production) oriented than the international product life cycle. The classic product life cycle (Figure 2) is divided into four phases: introduction, growth, maturity, and decline (Smallwood, 1973). Mathematically, the product life cycle curve can be expressed as follows:

$$q_t = (a_0 + a_1 q_{t-1}) (1 - a_2)^t$$

where  $q_t$  is the sale of the product at time  $t$ ,  $a_0$  is the initial sale,  $a_1$  is a growth factor and  $a_2$  is an obsolescence factor. Depending on the values of  $a_1$  and  $a_2$ , the growth and decline phases will be longer or shorter, respectively.

Figure 2. Product life cycle and strategic implications



The phases of the product life cycle are usually related to certain business strategies, which are deemed appropriate for the various phases (Day, 1986). Thus, the *introduction phase* can be supported by a skimming or a penetration strategy, indicating attempts to charge high prices in the introduction phase in order to benefit from customers who are willing to pay a premium for new products, or to charge low prices in the introduction phase in order to establish a high market share and rapid cost savings due to experience effects. The *growth phase* is, for the introducer, a phase of quality consolidation, and a phase of imitation and me-too products for competitors to the introducer. The *maturity phase* is considered a phase for product differentiation and/or cost reduction, and the *decline phase* is apt for deinvestment or attempts to find new uses and/or markets for the product.

The PLC concept has been widely used in marketing as a frame of reference, but in spite of its popularity there have been remarkably few studies examining it empirically (Midgley, 1981). Also, the concept has been subject to substantial criticism (see eg Dhalla & Yuspeh, 1976; Lambkin & Day, 1989). The major critical points will be briefly summarised.

*The borders between the different stages are unclear*, making it difficult to estimate a product's position on the life cycle curve. This can lead to self-fulfilling prophecies (Dhalla & Yuspeh, 1976): If firms in an industry prematurely believe that their product is in the maturity stage and take the prescribed measures and reduce marketing costs, this will have the effect that sales actually slow down. But this could also attract competitors from neighbouring markets or other geographic regions, and as they enter the market with heavy marketing expenditures, the market could go back to the growth phase.

These effects of the choice of strategy on the development of sales over time imply that there are *many different shapes of life cycle curves* (Rink & Swan, 1982). Researchers have identified several life cycle patterns applying to varying situations and industries (Midgley, 1981). The development of sales can evidently be altered by the actions of the companies in the market. Intensified marketing activities can, for instance, prolong the life of a product in the decline phase. This indicates that the concept should be used as an instrument of thought in the identification of the determinants of sales, and not as a normative tool for identifying the proper strategy in a given situation.

It can also be rather challenging to clearly *define industries or product categories*. The borders between product categories are often quite blurred. When are changes in existing products modifications, and *not* new products? (Day, 1990). Woodlock (1964) actually argues that the PLC model is only valid when promotional expenditures are constant over time, not only for the product itself but also for competing products, and when product quality is maintained at the same level during the period. Also, the product must not be adapted for new uses, thereby creating a new market. There must be no significant changes in package or package design. The price structure must remain the same. Availability to the customer should not be increased or decreased significantly. The competitive structure should not be altered significantly.

Obviously, in practice, these factors are never constant. In addition, taking these constraints seriously would mean leaving a PLC and entering a new one as soon as implementation of the

strategic recommendations that follow with the various PLC stages was attempted, as they obviously aim at changing some of the factors Woodlock argues should be kept constant.

The criticism indicates that a product life cycle cannot be regarded as a deterministic theory relating sales to time (Lambkin & Day, 1989). The PLC concept must be regarded merely as an attempt to describe the market development as a dynamic process with many factors, which affect the sales of a product over time. In the introduction and growth phases, customer diffusion and adoption processes, together with competitor behaviour, are main determinants for the shape of the curve. In the maturity and decline phases, changes in production technology, technology innovation, and psychological obsolescence are major determinants. Estimating some of these relationships, either based on time series or on cross-sectional data, could give useful information for understanding the development of sales over time and its strategic implications.

### **Lagged life cycles and market evolution**

It is possible to combine the traditional PLC concept and the concept of the international product life cycle into a common view of the development of sales for a product in various countries/markets. Usually it is assumed that sizeable export from the initiating country only starts after competitive growth on the home market kicks off (Ayal, 1981). This means that life cycles on the home market and the export markets will be lagged. If furthermore there is a sequence of export markets, as suggested by the international life cycle concept and theories of internationalisation, we get a series of lagged life cycles. Let us call these type I lags. In addition, when the product enters maturity and decline stages on the home and possibly the first group of export markets, and new product development takes place, we get a second group of product life cycles for the new product, which are lagged with respect to the life cycles of the original product. These will be denominated type II lags. Both types of lags are illustrated in Figure 3.

In Figure 3, countries are grouped on the assumption that their life cycles and lag structures are identical. In addition, all lags have the same length, and all life cycles have the same shape. In a complex world, it is highly unlikely that any two countries are alike on all determining factors; this means that the life cycle curves will vary with respect to shape and in the way they are lagged to each other. The major building block in developing an understanding of lagged life cycle structures is therefore to develop a framework that pins down the major factors determining the evolution of the size of a market over time.

Lambkin and Day (1989) offer a conceptual framework for analysing market evolution. They argue that four forces underlie market development: the demand system, also called market environment; the supply system, also called competitive environment; and the supporting resource environment, consisting of industry and exogenous resources (Figure 4).

Figure 3. The lagged life cycle structure

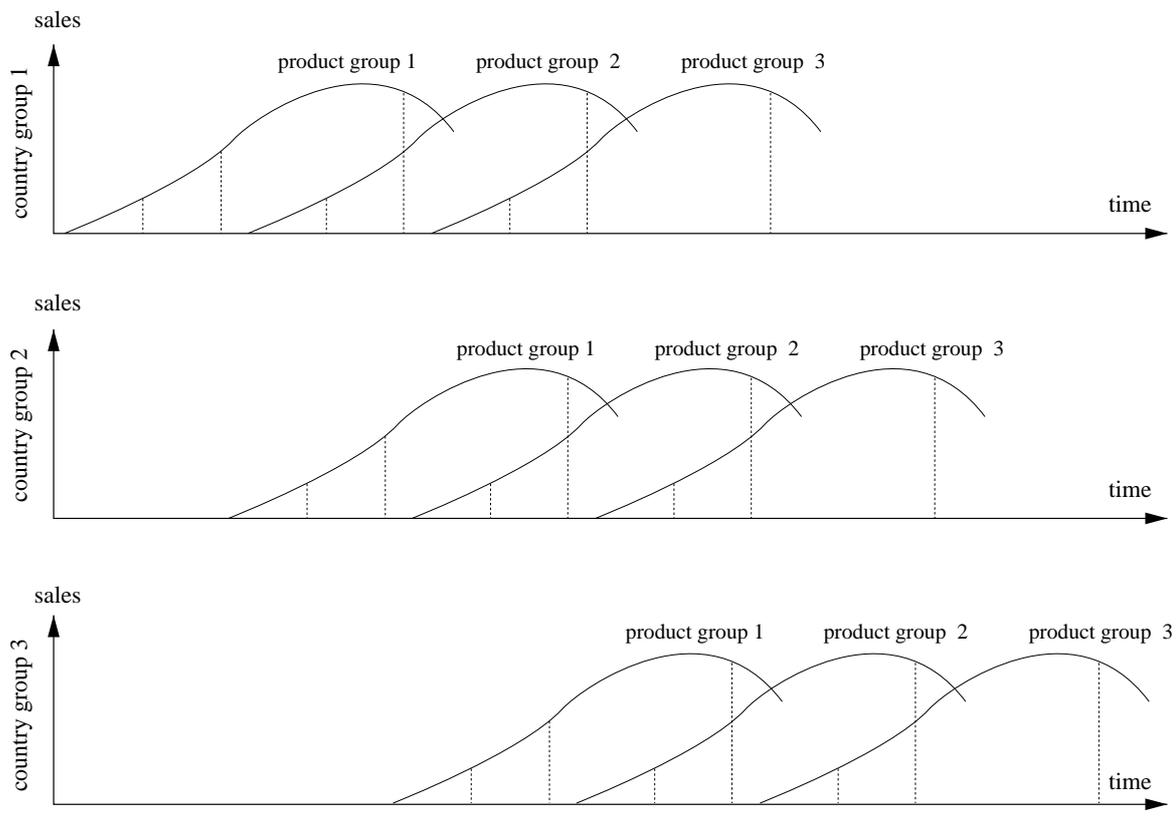
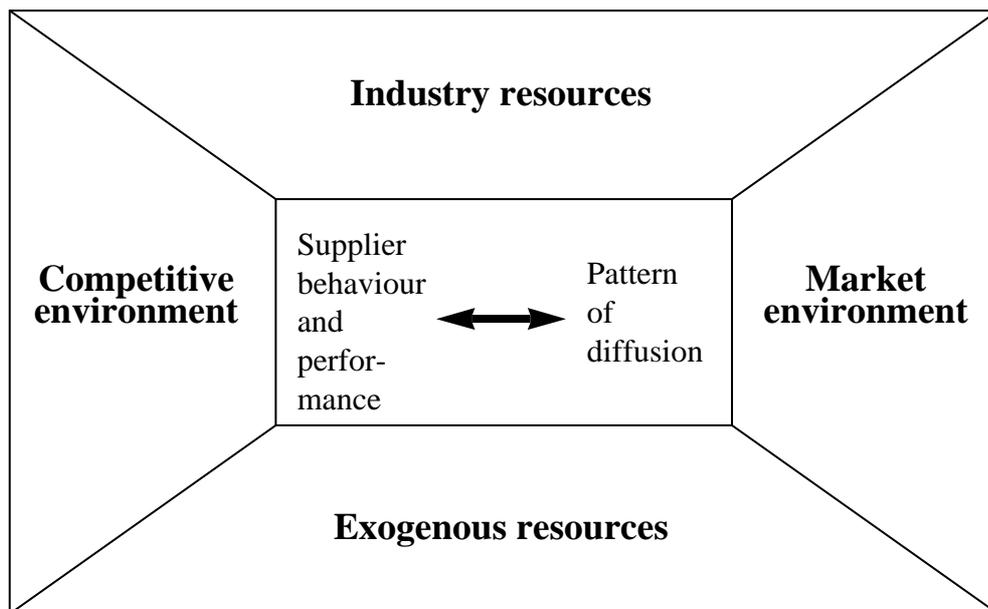


Figure 4. A framework for understanding market evolution (from Lambkin & Day, 1989)

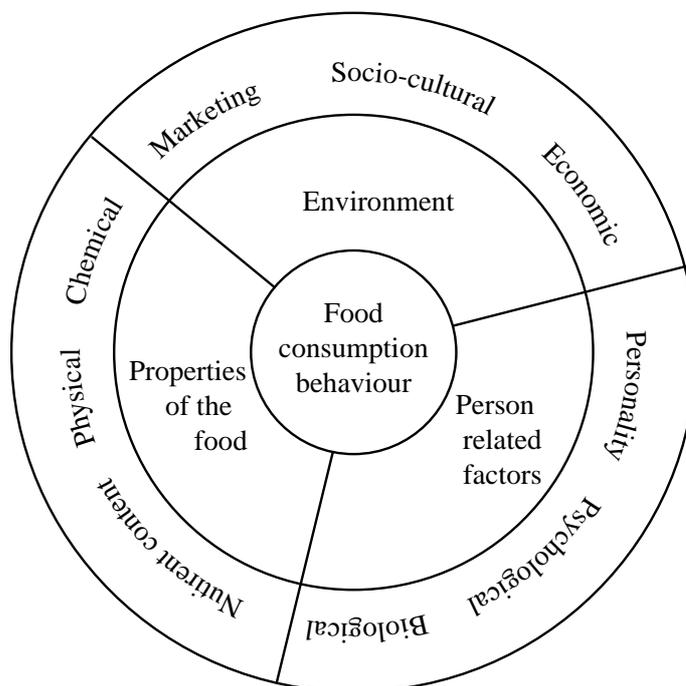


### 3. Sales determinants for food products

#### Individual level and aggregate level factors

Determinants for the consumption of food products are widely researched. Meal activities take up a great deal of our attention, no matter who we are, and where we live. However, most of the work on food choice is concerned with determinants at the individual level (see Steenkamp, 1992). Steenkamp, in his onion model of food consumption behaviour (Figure 5), distinguishes between three classes of determinants of food choice at the individual level: properties of the food, person related, and environmental factors.

Figure 5. Individual determinants of food consumption behaviour (from Steenkamp, 1992)



In the search for food choice determinants, which can be used to explain how the sales of a given product category vary over time and between markets or countries, we have to adopt a macro-oriented perspective. By starting from pre-established food product categories, the properties of the food are held constant. By aggregating to the market/country level, the person related factors are eliminated, at least to the extent that they become embedded in the cultural environment of the market/country. Hence, we are mostly concerned with the environmental factors, and our unit of analysis is the market/country.

One fundamental assumption, which has to be made in a study at this level of analysis, is that universal factors determining the consumption on a global scale actually exist (Jelliffe, 1967; Connor, 1991). To some extent, this means that basically consumers are alike. Having similar socio-demographic characteristics, facing the same relative prices, holding the same information, and living in a comparable cultural setting, consumers choose from the same array of goods.

In our systematic search for these determinants, we turn to the framework of Lambkin and Day (Figure 4). They classify determinants into four groups: demographic/economic factors (exogenous resources), cultural factors (market environment), distributional factors (industry resources), and competitive factors (competitive environment). Our focus is slightly different from Lambkin and Day's original focus. This modification is primarily made for the purpose of adapting the research design to global conditions, in order to ensure comparability between the various countries. The framework is then used to construct a catalogue of variables to be integrated in a market surveillance model.

In the following, we shall elaborate on the determinants to be included in the catalogue. Prior research will be studied in order to identify possibly relevant factors, and will be related to the product groups in question and their usage situations. This applies especially to the cultural dimension.

### **Economic and socio-demographic factors**

Empirical economic analyses have made it possible to explain a significant proportion of changes in the demand for food (Blandford, 1986). After all, a considerable share of most households' income is spent on acquisition of food, rendering food consumption an economic activity of major importance.

Economic factors are related to many aspects of society. Therefore, economic and socio-demographic factors will be interrelated. When we now present a list of possible explanators, it should be kept in mind that many of them are correlated, which has to be taken into account in the analysis.

*Per capita income* is expected to be a main sales determinant of a food product. As early as 1857, the Prussian mathematician Engels discovered that the percentage of income spent on food tends to decrease as family income rises. It finally reaches a saturation point. At the same time, the absolute amount spent on food increases. As the family becomes wealthier, it tends to acquire more expensive tastes. We therefore expect that higher income results in demand for food products of a higher quality.

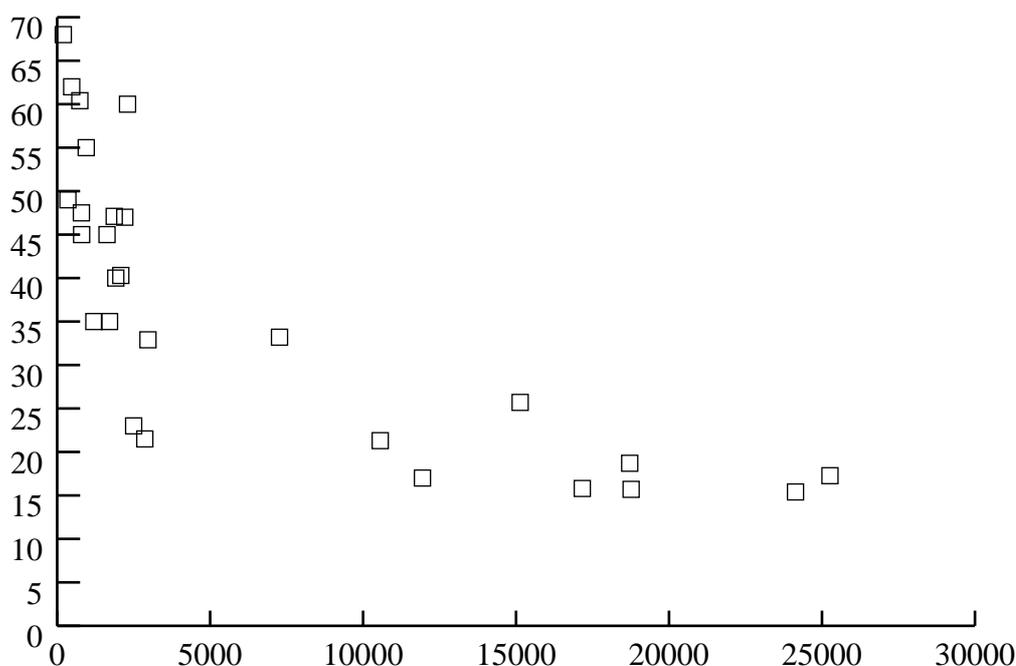
Engel's observations have been validated a number of times by other studies (see eg Blandford, 1986, for a study based on OECD statistics). As a sideline, data from our own study, to be reported below, indicates that the relationship also holds for a range of countries with considerable differences in state of economic development (see Figure 6). A multiplicative (nonlinear) function accounted for 79% of the variance.

Another relevant socio-economic factor is the *distribution of disposable income of the population* within a country. It is conceivable that the evoked set of products 'within reach' of the consumer segments depend on their disposable income. If a large proportion of the population lives below the poverty level, this obviously means that the market potential for any food product is relatively small. A broad middle income class indicates a large potential

market for many types of food products. The size of the high income class indicates the size of the market for luxury-type products.

Quite a number of factors correlate strongly with income level. *Education* and *employment* are partly related to income but influence the demand for food products also in their own right.

Figure 6. Illustrating “Engel’s law”



$$y = 3.98 \cdot x^{-.31}$$

where y = share of expenditure spent on food, and x = GNP per capita

Adj. R<sup>2</sup> = 0.785; F = 96.13 and p ≤ 0.0001

Employment will have an impact on disposable time (Bonke, 1992). When time becomes a scarce resource, the decreasing time available for shopping and meal preparation leads to food products of longer durability and higher degree of processing to become more attractive. It is difficult to obtain data on households’ disposable time, but since dual-career households and female labour-force participation go hand-in-hand (Connor, 1991), the percentage of *women in the workforce* can be expected to be correlated with how scarce time is in the respective markets.

Employment in various sectors of the economy will influence demand for certain types of food products. The *agricultural share of employment*, or alternatively, the *agricultural share of GNP* may have an impact on the demand for food products of various degrees of processing. Farmers usually have access to fresh meat, and when the primary sector is relatively large, the market for highly value added food products is correspondingly small. This means that one should expect a negative relationship between a large primary sector and the market potential for canned pork.

Education can be related to food choice by its impact on *literacy*. Literacy seems to be a prerequisite for certain types of food choice. Knowledge about products and the ability to process information influence the perceived risk of the consumers. The effect of product information concerning health and environmental aspects of food products will thus depend on the degree of literacy, and in general, health concerns could be expected to be of less importance with lower degrees of literacy.

*Household size*, measured as the *average number of persons in a household*, may have an impact on food consumption. Smaller households can be expected to have a higher per capita consumption of food, because economies of scale in procurement and preparation are more difficult to realise. Small households also result in more single-person meals, where the effect of cultural norms on eating may be less pronounced. Often single persons are more convenience-oriented, since they only cook for themselves. They buy smaller packages, and tend to purchase more food away from home (Connor, 1991).

*Ownership of household appliances*, even though strongly related to income, may be an important stand-alone determinant of food choice. Ownership of *microwave ovens per household* denotes emphasis put on convenience. High rates of ownership will also indicate that there is openness and willingness towards new products. *Refrigerators per household* can affect the demand for canned/frozen/fresh food products, when storage is a vital aspect. In addition, lack of refrigeration capacity could influence the demand for canned products in a positive direction, especially when transportation is troublesome and time consuming.

The degree of *urbanisation*, measured as the *share of the population living in urban areas*, can likewise have an impact on the demand for fresh versus processed food products, because rural areas can be expected to have a stronger tradition for eating fresh food. Urbanisation also affects market potential because the concentration of a lot of people in one place makes such places easily accessible. Larger cities also tend to have better facilities for shipping and handling goods.

Finally, the *age distribution* may have an impact on food choice. In industrialised countries, life expectancy is high. Young people are on the other hand apt to be more innovative, resulting in a lesser impact of cultural norms on eating behaviour. Older people, who are generally more conservative, have other food preferences than people in the work force, who tend to have a higher calorie intake.

### **Cultural factors**

There are many reasons why food habits and hence the demand for food products differ among countries. When the level of economic activity of a country rises, increasing disposable income often causes consumers to shift to other products. Still, this does not mean that all countries, at a certain economic level, consume equivalent products. The cultural environment is more static than the economic factors presented in the previous section, but these are fundamental when trying to comprehend the relations between a market and its surroundings.

When exploring cultural influences, the dilemma between being too specific or being too abstract frequently poses a problem. This is probably due to the concept of culture itself. There is no ultimate definition of the concept of culture (and we shall refrain from referring to Kroeber and Kluckhohn's list of 162 definitions of culture). McCracken (1990) perceives consumer goods as vehicles of cultural meanings, and views culture and consumption from an anthropological perspective. A similar view is taken by Murcott (1986) and Twigg (1984). This angle is used as the point of departure in our attempt to organise the various aspects of cultural influence on meat consumption, because it offers a useful approach to the different levels of abstraction from the very broad symbolic meaning of values to the specific influence of product attributes. This is also consistent with Grunert and Brunsø's framework for food-related lifestyle (Grunert, Brunsø & Bisp, 1993).

Figure 7. Cultural forces influencing meat consumption behaviour

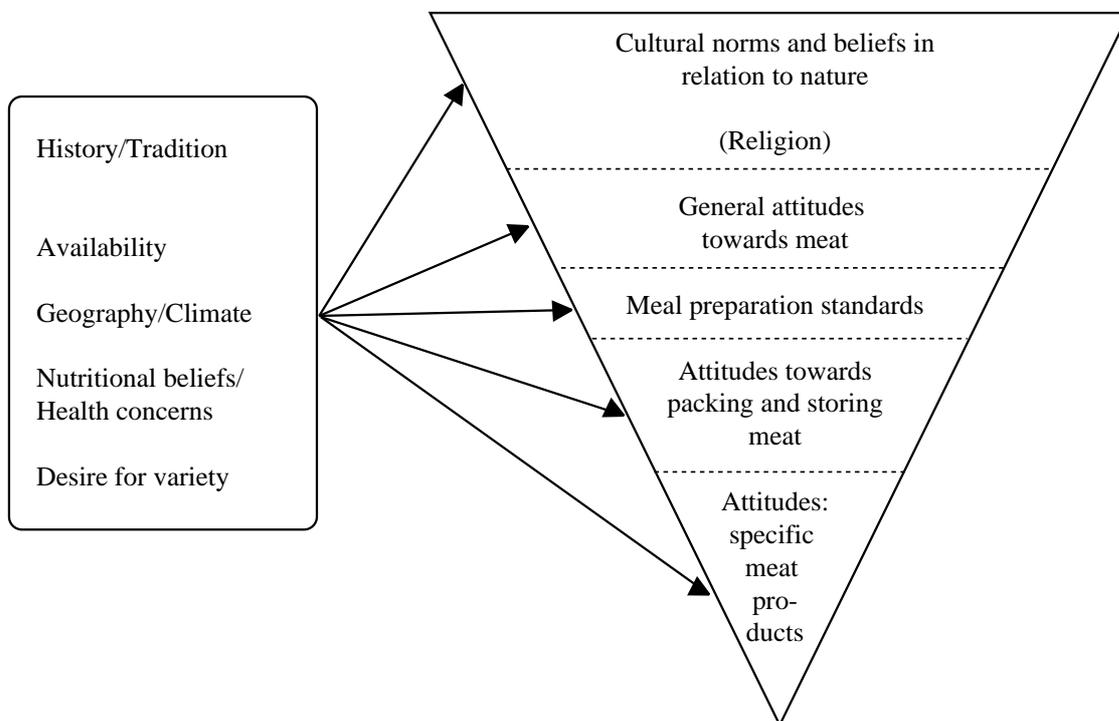


Figure 7 displays a framework for analysing the influence of fundamental environmental forces on the perception of meat and meat products at different levels.

We can distinguish an array of environmental factors that influence meat culture at different levels of abstraction. The higher the level of abstraction, the more stable the cultural aspects of meat consumption, and the lower the level of abstraction, the more dynamic the cultural aspects of meat consumption. The environmental factors include:

- Availability of foods
- Geography/climate
- History/tradition
- Nutritional beliefs/health concerns
- Desire for variety

In primitive economies, food consumption is determined by what is produced in the area. Specific food production systems are developed in order to exploit specific resources and ecosystems. If there is no exchange of goods, it is necessary to consume what is at hand.

This is related to the fact that the *geography* and *climate* of a country can influence what kind of crops or animals it is feasible to grow and keep. This is mostly important when a country does not have significant trade with other countries, but is fundamental in understanding the traditions of the country.

*History* and *tradition* have an important impact on which types of meat are acceptable for consumption. History affects the social system, inflicting social norms and the significance of the family in meal situations. Events such as Thanksgiving, where Americans eat roast turkey or New Years Eve, where Danes are very likely to serve poached cod, are occasions where history or tradition prescribe, not only what to eat at which meal, but also the proper preparation method.

*Nutritional beliefs/health concerns* significantly affect attitudes towards eating behaviour. These can be based on scientific evidence, on discussions in the mass media, on traditional beliefs and experience as to what is good for you, or just on superstition. Beliefs about nutrition and health are often disputed and change over time, causing frustration among those trying to heed 'doctor's orders'. These beliefs are sometimes related to avoidance of certain types of food. East African women are supposed to avoid eggs for infertility reasons (Jelliffe, 1967). Early twentieth century conventional wisdom in the UK recommended vegetarian diets as the best cure against self-abuse (Murcott, 1986). Chinese meal culture operates with the balancing of foods according to ancient principles restoring strength of the body by eating "hot" food.

*Desire for variety* is a manifest consequence of affluence. In a society where we no longer are preoccupied with merely satisfying hunger, food consumption becomes an instrument in our effort to make statements about ourselves. We express ourselves by adopting food-related life styles, which can be described as systems of cognitive categories, scripts, and their associations, which relate food perceptions to a set of values (Grunert, Brunsø & Bisp, 1993).

We will now go through cultural factors affecting the consumption of meat products in general and canned pork products in particular. In accordance with Figure 7, the presentation starts at the abstract level and then moves along to more concrete factors.

*Cultural norms and beliefs in relation to nature - the influence of religion on perception of meat.* It is commonly accepted that eating satisfies both physiological and psychological

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needs (Barthes, 1961; Grunert, 1991). Beyond the physiological needs, the choice of food products depends on a culture-specific classification of Nature's elements. Preparing meals creates a relationship between the acting individual and his/her environment. Cultures can differ considerably in how Nature's elements are classified with regard to their possible role as food, and hence in the way the relationship between the individual and his/her environment is formed.

Being an orthodox of certain religions has a well known impact on meat consumption. Muslims and Jews do not eat pork. Hindus do not eat beef. But, as Murcott (1986) points out, it is of greater interest to examine why certain religions forbid the consumption of certain meat types.

Anthropologists argue that the reason why Jews reject pork is to be sought in their past history as herdsmen of sheep and goats (Douglas, 1975; Murcott, 1986). Being familiar with these animals resulted in the view that animals with a different hoof structure such as hares and pigs were unacceptable. The example shows the persistence of food consumption habits which have local roots, and displays the importance of religion as a cultural indicator in food consumption. Sharing the same cultural heritage, habits and surroundings, these Jewish people were unfamiliar with pigs, causing them to avoid eating pork:

“Nothing whatsoever is said about its dirty scavenging habits. As the pig does not yield milk, hide, or wool, there is no other reason for keeping it except its flesh. And if the Israelites did not keep pig they would not be familiar with its habits.”

(Douglas, 1970)

It is therefore the relation between tradition and religion that makes religion an indicator of food/meat consumption, and not religion itself. Familiarity and conformity to tradition is the underlying force, rather than religion itself.

*General attitudes towards meat.* In general, cultures may differ in their attitude towards eating meat, or towards eating pork. In Western cultures, it is usually unacceptable to eat meat from animals, which, like humans, are carnivorous. These types of animals are too remote from us and thus too unfamiliar. As opposed to this, we find it hard to eat pets, even when they belong to a species normally used for human food. The distance to nature is a way of viewing human beings' classification of meat.

Considerable differences may also exist in the way meat is prepared for consumption. Attempts may or may not be made to hide the origin of the meat, ie the animal. Characteristic parts of the animal, like the head, may therefore be acceptable or unacceptable to eat. Visible blood in the prepared meal may be regarded as a plus or a minus.

Almost all cultures build their principal meal around meat (Twigg, 1984). Meat has social significance in family gatherings, making friendships, prestige by offering dinners etc. There also appears to be a hierarchy of meat. Some types of meat are more prestigious than others. This varies from country to country, not only as to which type of meat is the most prestigious, but also as to which part of the animal the meat comes from.

There is a close relation between the basic forces that determine cultural norms and beliefs in relation to nature (ie religion) and those affecting general attitudes towards meat. However, general attitudes towards meat are more easily altered, even though they are still fairly static in a society. Attitudes towards meat can be used as a guide-line for screening the markets for new product possibilities, and for creating an understanding of in which situations certain meat types or products are suitable or unacceptable.

*Meal preparation standards.* How we prepare our meals and how we eat them are significantly different across cultures, and may thus be used to discriminate cultures. Each culture has its own peculiarities when it comes to preparation and consumption of food. This is quite often a very noticeable part of culture. It is common to describe other cultures by what they eat. When asked what they know about Denmark, the British, for instance, mention bacon, Danish pastry, and beer (Djursaa, 1988). They may refer to the French as “frogs”, the Germans as “krauts”, and Italians as “spaghettis”. Every culture has its cuisine, or meal culture, with recipes unique to the country. When a country acquires meal habits from other countries, it quite often adapts them to fit the habits of its own meal culture.

Meal culture, indicating, among other things, the type and number of meals usually eaten, will thus have considerable influence on the demand for food products. Other aspects of meal culture dictate what is regarded as “a proper meal”. This differs considerably from one country to the next, with regard to admissible or required ingredients, whether the meal should be hot or cold, how the food should be prepared, etc.

Related to both meal culture and the earlier mentioned demographic factors is the number of common family meals. Norms for what constitutes an acceptable meal with acceptable ingredients may vary according to whether one eats alone, or whether one prepares a meal for the family.

The interaction of meal culture and usage norms for a certain product - its admissible ways of use - will determine how a product will be used and for which occasion (Douglas, 1984). Products not in compliance with the meal culture of a society will be very difficult to market, because of the difficulty of adapting them to the existing meal culture. Danish producers of fish products were frustrated when trying to market canned cod roe to countries in the Asean region. Test marketing showed that the consumers liked the taste and were not put off by knowing the product's origin. In spite of this, the product was never a success, simply because the texture of the product made it very difficult to integrate it into prevailing eating habits.

*Attitudes towards packing and storing meat.* A country's meat storing habits have a large impact on the potential of different types of meat products. This obviously affects the market with respect to predominant packaging and preservation methods, and interacts with the prevailing meat purchasing habits and the nature of the distribution system. In this context, it is appropriate to look at canning as a method of packing and storing meat. The acceptability of canned meat depends on the general attitude towards canning as a storage method. However, in many countries canning as a packaging method is acceptable for some foods and unacceptable for others.

Often canned meat will be a good seller in countries where this type of packaging has a novelty value (often as a symbol of Western life style, where canning of food is widely accepted) and/or where the desired convenience is not achieved by other packaging or storing methods. Whether an ample local supply of fresh meat has been the tradition or not, can be expected to have an impact on the attitude towards canned meat products. Where fresh meat is traditionally available, canned meat will probably be bought mainly because of convenience, while canned meat may be regarded as generally more acceptable or perhaps even superior, where fresh meat is not widely available. This could be one reason why in general the demand for canned meat is considerably higher in island cultures.

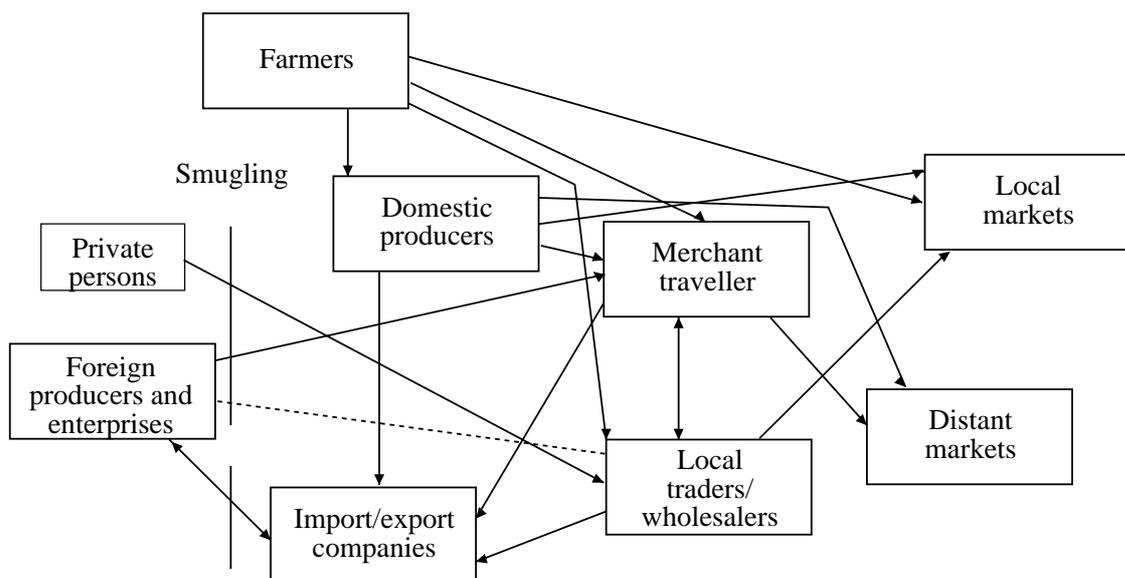
There is a trend towards a more negative attitude to cans as a packaging form in countries at a higher level of economy. But even in such countries it is possible that canned meat may have a niche in the market.

*Attitudes towards specific meat products.* How specific products are perceived and adapted to the meal culture is a complex process formed through the various levels connecting basic values with specific attributes. One way of addressing this issue is to look at how specific product attributes are linked to the higher-order cultural factors, up to the basic values which characterise a cultural environment.

**Distributional factors**

The point of purchase of meat products is obviously relevant for the possibilities of marketing different types of meat products. When analysing countries with widely varying levels of economic development, distribution structures will also vary widely. Whereas distribution systems in countries at a low level of development will be different from those at a high level, they will not necessarily be less complex, as demonstrated in the example in Figure 8.

Figure 8. The food distribution system in Vietnam



For the purposes of this study, we will concentrate on the characteristics of the distribution system which are related to the advantages or disadvantages of canning as a packaging form.

A rough measure for how many have physical access to a food product is the number of *food outlets per capita*. This number would be expected to be positively correlated with the development of the retail sector of a country. The density of retail outlets can also be related to the mobility of the population, which can be measured, eg, by the number of cars per capita, public transportation, urbanisation and road density. *Coverage* indicates how large a share of the food outlets currently carries the product group in question. Related to this measure is *geographic diversity*. It is conceivable that a large percentage of the food stores in a country are situated in large cities. If, in addition, the country has a low level of urbanisation, this would mean that in spite of high coverage in the existing distribution system, the amount of people who actually have access to the product would still be fairly limited.

As mentioned previously, an important functional aspect of canned food products is their storage potential. Some canned meat products have best-before dates of up to five years, making them particularly apt in situations where long transportation and storage time are the rule rather than the exception. It must be anticipated that there is a reverse relationship between *availability of cooling devices*, such as refrigerators and freezers, and the need for the functional characteristics of canned meat products. The availability of cooling devices in retail outlets is thus expected to be a major determinant for the types of products which can be sold, since a lack of cooling devices and corresponding problems in selling fresh meat will have a positive impact on the sales of processed, especially canned, meat.

The substitution relationship between fresh and processed meat can also be related to the existing distribution system for fresh meat products. When conditions are favourable for *transporting* fresh meat (or live animals) in the country, people are more likely to consume fresh rather than processed (canned) meat. Factors such as number of trucks, road density/-quality, shipping equipment, railroads etc. result in a “high” or “low” score on this dimension.

### **Competitive factors**

The demand for any given product will be influenced by the availability of substitutes, and by the relative prices of the product and its substitutes. Relative prices of substitutes will differ considerably between markets/countries. There will also be considerable variation with respect to which products are regarded as substitutes.

We define two levels of substitution, primary and secondary. Direct substitutes are products which fall within the same product category. Secondary substitutes are product categories that fulfil the same basic needs. The degree of substitutability can be ascertained on the basis of the products' cross-price elasticity; this has been done at length in the literature. Tangermann (1986) mentions that, if the price of pork goes up, the consumer will not only buy less pork, they will also buy more chicken. Our own data corroborated this finding.

Primary substitutes are other canned meat products. The competitive situation of these products can be characterised by the products' relative prices, and by the number and type of direct competitors - their size, their cost situation, their products, their marketing strategies. These characteristics are widely regarded as indicators of the stage of the product life cycle in question.

Secondary substitutes are fresh meat - mainly pork, beef, and chicken. These are global substitutes. On specific markets, secondary substitutes may be many different kinds of food products.

Finally, tariffs can have a major impact on the price of imported canned meat products relative to both fresh meat and domestically produced canned meat.

#### **4. Research plan and preliminary investigations**

As explained in Section 1, the overall aim of the research carried out was to construct a model that could be used to predict changes in the demand for canned pork products on various markets world-wide. In the preceding section, possible explanatory variables have been discussed. Based on this, the empirical work was organised in the following phases.

##### **Classification of products**

Within the wide product area to be covered by the research process, product variants/categories have to be grouped in such a way that it becomes meaningful to talk about a life cycle for that group of products. Degree of processing and added value can be expected to be important criteria in this grouping.

A decision was made to work with two types of canned pork products, which are denoted A and B in the following. It was assumed that the level of market development for product A is lagged with regard to the level of market development of product B, and that the products are in different stages of their life cycle in different export areas of the world. The classifications into product groups were based on many aspects including texture of the meat, perceived quality by consumers, and usage or function oriented dimensions of the products.

##### **Operationalisation of 'market'**

The research was carried out at country level. Obviously it is always questionable whether this is the most useful unit of analysis, as many aspects of nutrition and eating habits stretch across borders, leading to the conclusion that markets may not be identical to countries. The current state of statistical market information available in most countries, however, does not allow the application of other units of analysis. One exception was made by including the island of Okinawa. This was done in order to study a region where the consumption of the

relevant products was extremely high, thus rendering this area particularly interesting when trying to identify possible determinants of high levels of consumption.

### **Operationalisation of sales determinants**

Table 1 shows the sales determinants included in the study. The list was based on the discussion of sales determinants in the preceding section. The table also shows how the various variables were operationalised. Some operationalisations warrant additional comment.

As for income distribution, it would have been preferable to gather “income brackets” for the population in each country so that the income brackets would reflect segments favouring certain types of products. These figures are, however, not comparable. The form of the income distribution is therefore used as a proxy. Each country is placed into one of three distribution categories: Third world, American, and Scandinavian distribution. Third world distribution resembles an F-distribution, whereas American and Scandinavian reflect normal distributions. The difference between the latter two is that the American has a large, and the Scandinavian a small standard deviation.

Most of the cultural determinants are difficult to quantify at the aggregate country level. Therefore we decided to condense them into a number of simple di- or trichotomous nominal level variables. Thus, countries are grouped into categories depending on whether their food culture is or is not meat-centred, whether the attitude towards canned pork is positive, neutral, negative, etc. Also one of the distributional variables had to be measured in this way.

*Table 1. Sales determinants and their operationalisation*

<b>Sales dimension</b>	<b>Sales determinant</b>	<b>Measurement</b>	
Economic/socio-demographic	Income	GNP per capita in USD  Form of income distribution: American Scandinavian Third World  % of income used for food	
	Employment	Work force ratio Women in labour force	
	Importance of agricultural sector	Agricultural share of employment Agricultural share of GNP	
	Education	Literacy rate	
	Household size	Average number of persons/household	
	Ownership of household appliances	Refrigerators and microwave ovens per household	
	Urbanisation	Share of population living in urban areas	
	Age of population	Share of population between 15-64	
	Cultural	Religion: Influence on meat consumption	Share of population belonging to a religion not eating pork
		Attitude towards meat	Food culture is/is not meat-centred
Attitude towards pork		Pork is/is not the most popular meat	
Access to fresh pork		Considerable/limited	
Attitude towards canned pork		Positive/negative/neutral	
Usage of the product		Many/few uses known	
Distributional	Retail structure	Food outlets per capita	
	Outlet characteristics	Share of outlets carrying canned meat Share of outlets with cooling devices	
	Possibilities of transporting fresh meat	Good/bad	
Competitive	Primary competition	Number of competing brands	
	Secondary competition	Price of most popular A/B product relative to price of other canned meat products  Price of A/B product relative to price of fresh pork, beef, chicken	
	Tariffs	Percentage of price (cif)	

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### **Preliminary analysis based on secondary data**

Before initiating the primary data collection, a preliminary study was carried out employing secondary data (details on this can be found in Baadsgaard, Grunert, Gede, & Jensen, 1992).

The aim of the analysis was to check whether the sales of the two product groups were indeed lagged as hypothesised, and to look at as many of the hypothesised relationships between sales volume and sales determinants as the data would allow.

The paucity of the data obtained severely limited which analyses could be carried out. Also, it turned out that many of the independent variables were correlated, resulting in a multicollinearity problem in deriving regression estimates. Still, it was possible to investigate the following aspects:

If sales of a product are related to per-capita income on the market in question, and if per-capita income increases secularly over time, then it will result in a non-linear relationship between per-capita income and sales of the two products across countries, giving indirect evidence for the existence of type I lags.

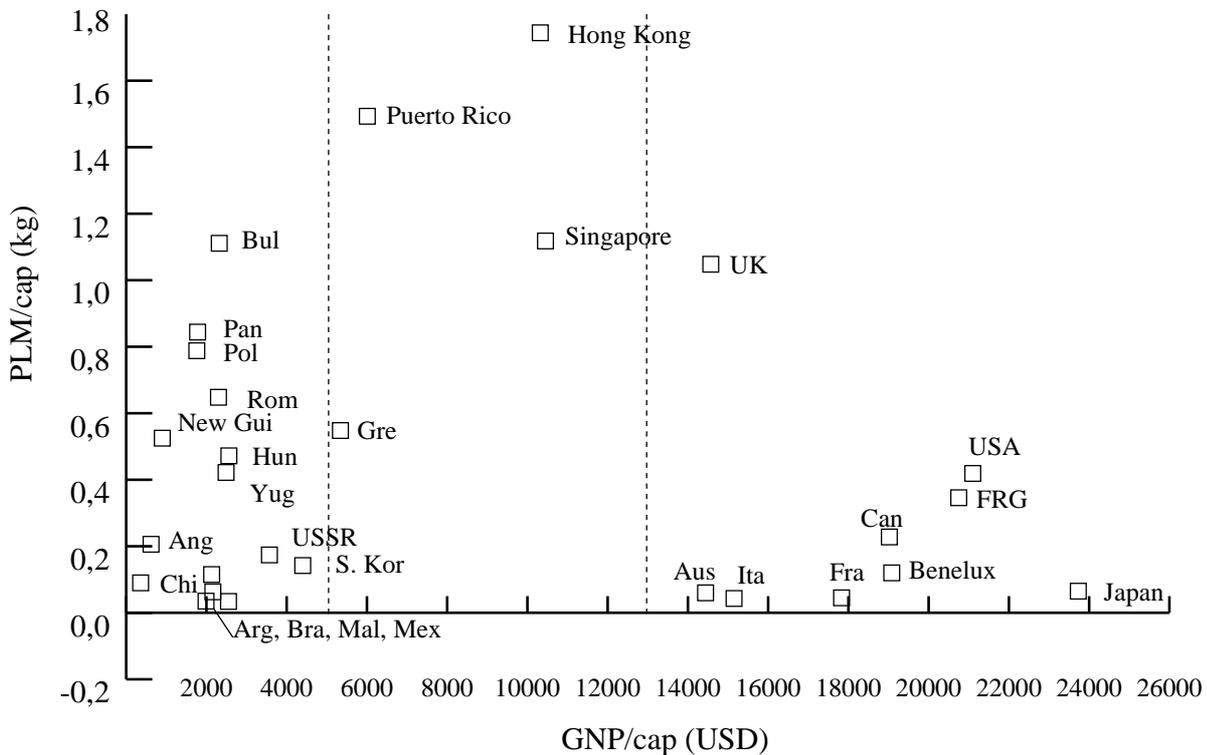
If increased economic welfare leads to a demand for higher-quality food products, and if the two products investigated can be ranked according to quality, then the function relating per-capita income to sales will be lagged for these two products, ie, give evidence for a type II lag.

If cultural, distributional, and competitive factors have an impact on sales, and, hence, the shape and location of the product life cycle, then there will be considerable unexplained variance when explaining sales by per-capita income only. In addition, it is possible to explain at least some of the residual variance by the cultural/distributional/competitive variables on which data were available.

Figure 9 shows an estimated relationship between per-capita income and per-capita sales of product A. It clearly shows a non-linear relationship, where first sales rise with increasing income, and fall again after having reached a certain ceiling. The estimated quadratic regression explains 20.4% of the variance in sales, whereas a linear regression explains only 1.3%, giving strong support to the notion of a non-linear relationship. Even though it is cross-sectional, the analysis thus indirectly supports the existence of type I lags for the life cycles of product A.

Estimates for product B turned out to be more difficult, because total sales data for this product could not be obtained. We only succeeded in obtaining data on total imports. Using these data, a quadratic function was estimated, though the non-linearity was less pronounced than for product A. This may indicate that the non-linearity becomes less pronounced as we move to products of a higher quality, which have not really reached a decline phase even in the countries with the highest per-capita income.

Figure 9. Relationship between per-capita income and per-capita sales of product A



Adj.  $R^2 = 0.20$ ;  $F = 3.194$ ;  $P = 0.0582$

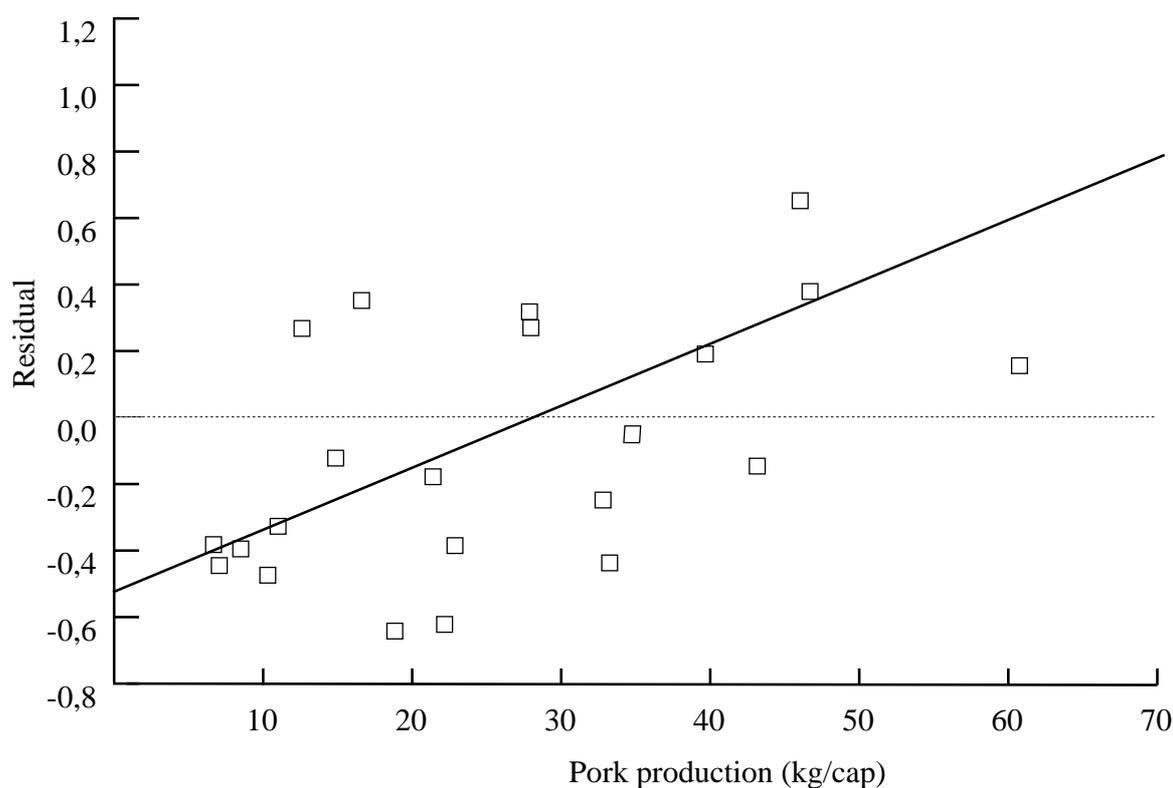
Relating the results for products A and B to each other, the functions indeed appeared to be lagged to each other, indicating a type II lag structure. However, the uncertainties about the sales data for product B make this result less convincing.

Starting from the relationship between A sales and per-capita income in Figure 9, it was investigated whether cultural/distributional/competitive factors can explain some of the residual variance. Figure 10 shows the relationship between the residuals from the model in Figure 9 and pork production (in kgs) per inhabitant, which can be interpreted as an indicator of to which extent local food culture is averse to eating pork. 37% of the residual variance can be explained by this simple variable, taken as a proxy for a cultural factor.

It could be shown that several other variables were significantly related to the residuals from Figure 9. At any given level of per-capita income, it could be shown that the sales of A

rise with the number of inhabitants per retail outlet. This indicates that a lower retail outlet density, which leads to longer average distances and hence travelling to the nearest retailer, increases A consumption. This was expected, because longer travelling will increase emphasis on durability and detract from the demand for fresh meat products

Figure 10. Relationship between residuals from Figure 9 and per-capita pork production



Adj.  $R^2 = 0.27$ ;  $F = 7.34$ ;  $p = 0.13$

fall as the average size of the household increases. This, too, was expected, based on the argument that in smaller households (especially single-person households) joint family meals will be less important socially, and canned meat products may therefore be more acceptable

rise with an increasing degree of urbanisation. This was expected based on the notion that urban environments have less tradition for eating fresh food products in general, and meat products in particular, than rural environments

fall with increasing alphabetism, supporting the assumption that literacy is a prerequisite for more sophisticated cooking and eating

These results clearly indicate that non-economic factors have considerable power in explaining differences in sales levels in different countries.

These results can only be regarded as very preliminary. It quickly turned out that the estimation of a world-wide model cannot be based on data from secondary sources, as these sources simply are not available. A primary data collection was therefore necessary.

Table 2. The country selection

Western Europe	Eastern Europe	Asia	Latin America	Africa
Denmark	Bulgaria	Hong Kong	Argentina	Cameroon
Eire	Czechoslovakia	Indonesia	Brazil	Kenya
Germany*	Hungary	Malaysia	Cuba	South Africa*
Italy*	Poland	Okinawa*	Guatemala	
Netherlands*	Romania	Thailand	Mexico*	
United Kingdom		Vietnam	Nicaragua	

\* Based on secondary data.

### Selection of countries for the main study

The selection of countries to be included in the primary data collection touched on a number of aspects. The aim was to structure the country sample in such a manner that it would reflect a wide variation with regard to the sales determinants in Table 1. We finally arrived at the country sample in Table 2.

Given such a diverse set of countries, the possibilities of collecting the desired data can be expected to be diverse as well. Therefore, the data gathering methods employed varied substantially from country to country. Primary data collection was not necessary for a number of countries, as the desired information could be obtained from secondary sources.

### Primary data collection

The aim of the primary data collection was to find data for the countries in Table 2 with regard to the sales determinants in Table 1, and with regard to the total sales volume of products A and B. As mentioned previously, preliminary research had shown that for most of the countries such data were difficult or impossible to get from secondary sources.

The data sources used in the primary data collection were expert interviews, statistical information collected in the field, store audits, and market reports. Some of these sources are obviously borderline cases between primary and secondary data sources. Even an expert interview could be called a secondary source, because the knowledge of the expert has not been accumulated for the purpose of the study. A more appropriate description would be to distinguish between in-market and out-market data sources. Primary data collection covers information collected by the researcher being actually present on the market/in the country in question, ie in-market information, whereas the information in the preliminary investigation was collected out-market, without actually visiting the country.

The aim was to use as many sources for each country as possible, in order to cross-validate the results. This is especially the case for the estimates of total sales volume, which are the most central and sensitive variables in the study.

*Expert interviews.* Although it should be understood that there is no single, exclusive, optimal way of using expertise (Helmer, 1966), the problem called for the judgement of several kinds of experts, who could roughly be regarded as belonging to three categories.

The first category consisted of experts knowledgeable about the culture in the country in question, and if possible about food and eating habits. This group could include persons from universities. Anthropologists, sociologists, and nutritionists fall into this category. A second category of experts were persons with insight into general socio-demographic and economic matters of the country. Statisticians, marketing people, among others, were helpful. A third category of experts were people acquainted with the specific products and the distribution system. This group included persons connected to the retail sector, importers, or wholesalers. Alternatively, people from meat processing companies were contacted.

In each country, a number of people falling into the categories mentioned were identified and contacted. In addition to participating in the study themselves, they were asked to recommend other experts. This was done in order to ensure that all prominent expert were contacted. In most countries it was possible to identify relevant experts and persuade them to participate in the study.

Commenting on using experts for research purposes, Jolson and Rossow (1971) noted:

“The technique usually followed is a function of the time available, the importance of the decision, the number of qualified judges available, and the relative merit of the alternative procedures by the decision maker.”

In this study a number of interview guidelines were generated, one for each category of experts. The interviews undertaken were semi-structured. If, during an interview, it was discovered that the respondent had information in some of the related areas, the dialogue was elaborated further into these matters. This was another way of cross-checking the information yield from the various sources.

Originally, it was intended to apply a Delphi-technique, in the sense that the experts were to be contacted later in order to respond to their own answers in comparison to the answers of the entire group. This proved to be rather difficult to carry through, as the interviewees were rather busy people. Instead, this comparison was made gradually by confronting the experts with statements from other experts. This gave valuable insight into the experts' own assumptions and facilitated verifying other sources.

*Other sources.* As mentioned, a number of additional information sources were utilised. This included statistical offices, store audits, and market reports. Statistical data were very useful as a starting point in each country. They usually gave a fairly accurate impression of the availability and quality of official statistics in the country. Store audits were conducted in the various types of retail stores carrying the product groups. Usually, purchasing managers were contacted. This resulted in valuable information about the market with respect to market shares of direct competition, size and speed of sales of the products, knowledge about which

foods could be regarded as competing product categories. Great caution was taken to avoid overemphasising the observations made, as it was impossible to call on a representative sample of stores in each country. Market reports dealing with the market for canned meat and similar subjects were used when available.

Data analysis and results will be discussed in the next section.

## 5. Data analysis and results

Multiple regression analysis was used in order to relate the dependent variable, ie total sales volume for products A and B, to the various predictors. However, many of the predictors were expected to be correlated. Also, the limited size of the data set, with 26 units of analysis, results in very low statistical power for models involving a large number of predictors.

Basically there are two ways of solving this problem. The data can be reduced to a number of underlying orthogonal dimensions by performing a principal components analysis; these dimensions would then be used as predictors. Alternatively, a stepwise regression procedure could be used, which would result in a set of predictors with the highest explanatory power.

A transformed version of the total sales volume was used as the dependent variable. Since the size of the population of the country will be a dominating factor overshadowing all others, the total sales in tonnes were transformed into consumption in grams per capita. In addition, a simple linear model was regarded as unsatisfactory, since it could predict negative consumption, and also unrealistically high per-capita consumption. A logit transformation was therefore performed so that per-capita consumption tends towards zero at the lower end and towards a theoretical maximum at the upper end of the value range. The theoretical maximum for product A was set slightly above the per capita consumption in Okinawa, which is the highest in the world and considerably higher than per-capita consumption in all other countries. For product B, the theoretical maximum was set slightly higher than the per-capita consumption in the UK.

Finally, non-linear relationships between some of the sales determinants and per-capita consumption were expected. This is the case especially for factors relating to the level of economic development.

Two types of models were therefore estimated:

$$\log\left(\frac{S_{\max} - S_j}{S_j}\right) = a_0 \sum_i a_i F_{ji} + \sum_i \tilde{a}_i F_{ji}^2$$

$$\log\left(\frac{S_{\max} - S_j}{S_j}\right) = b_0 \sum_i b_i X_{ji} + \sum_i \tilde{b}_i X_{ji}^2$$

with

$S_{max}$	=	theoretical maximum per capita consumption in grams
$S_j$	=	per capita consumption in grams in country j
$F_{ij}$	=	score of principal component factor i for country j
$X_{ij}$	=	score of variable i for country j
$a_0, a_i, b_0, b_i,$	=	regression coefficients

The results of the principal component analysis are shown in Table 3. Seven factors with an eigenvalue higher than 1 (Kaiser criterion) were found. These factors were all reasonably interpretable. Most of them corresponded to the classification of variables described earlier.

For each factor, the variables with the highest loadings were standardized and summed to obtain factor scores. This procedure was chosen, because it makes it easier to use the resulting regression model for predictive purposes. These variables were then used to estimate the regression.

The estimates for the best fitting models of both types for products A and B are shown in Tables 4 to 7. For the purpose of incorporation into a predictive model, the model with the highest explanatory power was finally selected. For A, this turned out to be a factor score model. For B, it was a model based on the original variables.

Table 3. Principle component analysis

Variable	Factor loadings						
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
GNP per capita in USD							.760
American income distribution				-.585			
Scandinavian income distribution				.824			
% of income used for food	.546			.525			-.513
Women in labour force							
Agricultural share of employment	.534	-.627					
Agricultural share of GNP	.772						
Literacy rate		.741					
Average number of persons per household		-.827					
Refrigerators per household		.845					
Microwave ovens per household							.866
Share of population living in urban areas					-.504		
Share of population between 15-64							
Share of population belonging to a non pork-eating religion						.716	
Positive attitude towards canned meat			.819				
Negative attitude towards canned meat			-.810				
Food outlets per capita					.809		
Share of food outlets carrying canned meat		.803					
Share of food outlets with cooling devices		.758					
Good possibilities for transportation of fresh meat		.785					
Number of competing brands			.849				
Price of productA relative to price of fresh pork	.911						
Price of product A relative to price of fresh beef	.921						
Price of product A relative to price of fresh chicken	.957						
Price of productA relative to price of most popular meat	.919						
Tariffs as percentage of price (cif)							
<b>Factor interpretation</b>	Relative prices	Economic development	Attitude towards canned food	Socio-demography	Distribution	Religion	Income level

Note: only loadings above .5 are shown. Loadings are varimax-rotated.

In the model finally selected for product A, all factors were retained in the model except for the *religion* factor, which turned out to be insignificant. The *relative prices* factor was retained, even though its t-value is not quite significant. As expected, there is a quadratic relationship between *income level/economic development* and sales, leading to the prediction of sales volumes first rising and then falling again with increasing levels of income/economic development. Given the differences in level of economic development between the countries in the sample, this must be regarded as indirect evidence for the existence of a type I lag between life cycles for this product. Also for the other factors the signs point in the expected direction. The overall fit of the model must be regarded as very satisfactory.

The results for product B show that no quadratic terms were retained in the equation for this product. This seems to indicate that none of the countries in the sample has reached the declining slope of the product life cycle for product B. Comparing this to the results for product A, this is indirect evidence of the existence of a type II lag.

Table 4. Factor score model for prediction of A sales (model finally selected)

Predictor	beta-coefficient	t-value	probability
Relative prices	-.223	1.706	.1044
Economic development square	.721	6.413	.0001
Attitude towards canned food	.285	2.712	.0138
Socio-demography	-.201	1.909	.0715
Distribution	.797	2.882	.0095
Income level	.299	2.261	.0357
Income level squared	-.775	2.940	.0084

Adj.  $R^2 = 0.755$ , F for total regression = 12.426;  $p \leq 0.0001$

Table 5. Original variables model for prediction of A sales

Predictor	beta-coefficient	t-value	probability
Tariff (% of cif value)	-.019	3.289	.0037
Number of brands	.173	1.937	.067
Scandinavian income distribution	.681	1.8	.0869
Positive attitude towards canned meat	.756	1.739	.0974
Negative attitude towards canned meat	-.539	1.444	.1641
Literacy rate	-.021	1.42	.1711

Adj.  $R^2 = 0.666$ , F for total regression = 9.64;  $p \leq 0.0001$

Table 6. Factor score model for prediction of B sales

Predictor	beta-coefficient	t-value	probability
Relative prices	-.291	1.416	.1708
Economic development	.454	1.943	.065
Attitude towards canned food	.241	1.137	.2677
Religion	-.243	1.392	.1778

Adj.  $R^2 = 0.409$ , F for total regression = 5.496; p = 0.0032

Table 7. Original variables model for prediction of B sales (model finally selected)

Predictor	beta-coefficient	t-value	probability
Agricultural share of GNP	-.325	2.203	.0409
Share of population belonging to a religion not eating pork	-.288	2.279	.0351
Food outlets per capita	.255	2.075	.0526
GNP per capita in USD	.274	1.945	.0675
American income distribution	.366	2.805	.0117

Adj.  $R^2 = 0.673$ , F for total regression = 10.475; p = 0.0001

## 6. Discussion

The results obtained are interesting in three respects. First, the models estimated can support market screening and market surveillance by using them to simulate sales effects of changes in the independent variables. Secondly, the results shed some light on the existence of type I and II lags in international marketing. Finally, the study yields some methodological insights into conducting international research at country level.

*Simulating sales effects of changes in the independent variables.* The two models finally selected relate sets of predictors to per capita consumption of two types of products. The relationships found are theoretically plausible, and explained variance is satisfactory. The model can therefore be used to predict changes in sales based on assumptions about changes in the predictors. In addition, the model can be used to estimate sales for countries where information about the predictors is available, but not information about sales. Likewise, it is possible to estimate the market potential for countries where at present the market is closed for political reasons.

To facilitate this use of the model, it was implemented as a computer simulation, in which sales effects of various changes in the predictor variables can be tested. The simulation starts with the actual present market volume (where this information is available; otherwise the estimated market volume is substituted) and then uses the appropriate model to estimate the difference in sales which a difference in the predictors would bring about. This difference is then added to the present market volume in order to obtain a forecast. A built-in predictor elasticity facility shows how predictors differ in their influence on the sales volume.

*Shedding light on the existence of type I and II lags in international marketing.* The theoretical starting point of the present study was the fact that the development of sales over time can be described by a life cycle curve, that the curves of a product are lagged across countries (type I lag), and that curves for products with different levels of processing and/or quality will be lagged within countries (type II lag). Investigating such lags would principally require time series data. Very quickly we discovered that such data are impossible to get in a world-wide study. We thus referred to the fact that a life cycle is only a summary description of a number of explanatory variables working over time. An attempt was made to identify such variables and measure them. Given that these variables have different effects on sales of the products in question, and given that the countries analysed differ in their levels with regard to some of the predictor variables, we hoped to find indirect evidence with regard to both types of lags.

Such evidence was found. We found that the level of economic development is a strong predictor for both products investigated. However, for product A, which was the product with a lower degree of processing and/or quality, we found a quadratic relationship, whereas we only found a linear relationship for product B. This means that the more developed countries already had reached a downward-sloping section of the life cycle curve of product A, whereas the less developed countries can still be placed on the upward-sloping section. This is evidence of a type I lag. It also means that even the more developed countries are still on the onward sloping section for product B. Together with the fact that sales of B were generally lower in the less and higher in the more developed countries, this constitutes evidence of a type II lag. Therefore we find the concept of lagged life cycles a useful analytical tool for international marketing.

*Methodological insights into conducting international research at the country level.* We found that on-site (or 'in-market') field research can bring about data even in countries which in one way or another are regarded as remote, culturally distant, and difficult to get information about. By relying on a combination of expert interviews and data collection from documents and other sources, we could cross-validate much of the information found and come up with estimates which seem to have a very reasonable degree of reliability and validity. The fact that, based on these data, it was possible to estimate models with a high degree of explanatory power is in itself an indicator of the feasibility of this form of data collection.

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**MAPP deltager i/har gennemført følgende samarbejdsprojekter:**

**A/S Hatting Bageri**

Titel: *Udvikling og afprøvning af instrumenter til analyse af trends i forbrugernes og detaillisternes værdiopfattelse på eksportmarkederne*

**DIFTA m.fl.**

Titel: *Markedsstyret kvalitetsudvikling af danske åleprodukter med henblik på det tyske marked*

**Frigodan m.fl.**

Titel: *Strategiske dybfrosterter*

**Intergoods Bakery Ltd.**

Titel: *Udvikling af systemer, rutiner og værktøj til effektivisering af produktudviklingen og lanceringen på de internationale markeder for Intergoods Bakery Ltd.*

**MD Foods A.m.b.a. m.fl.**

Titel: *Kunde- og miljøtilpasset emballage- og distributionsteknik nationalt og internationalt*

**SANT + Bendix m.fl.**

Titel: *Styrkelse af produktudviklingsfunktionen i mellemstore fødevarer virksomheder*

**Slagteriernes Fællesindkøbsforening A.m.b.a. m.fl.**

Titel: *Udvikling af magnetisk fjernlæsbar mærker og tilhørende terminaludstyr til identifikation af kvæg bl.a. med henblik på forbedrede muligheder for kvalitet-, proces-, og avlskontrol og -udvikling*

**Slagteriernes Forskningsinstitut**

Titel: *Forbrugerundersøgelse af svinekød*

**Tulip International A/S**

Titel: *Kvalitetscertificering som nøglesuccesfaktor ved markedsføringen af danske fødevarer internationalt*

**Tulip International A/S**

Titel: *Udnyttelse af kulturelle forskelle i den internationale markedsføring*

**Tulip International A/S**

Titel: *Identifikation af produktlivscyklusser for kødprodukter i et globalt perspektiv*

## **MAPP publications**

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- No. 1: Grunert, K. G. & Baadsgaard, A. *market-based process and product innovation in the food sector: A Danish research programme*, January 1992.
- No. 2: Thøgersen, J. *Fødevarerinnovation og emballage - miljøkonsekvenser og forbrugerreaktioner*, Marts 1992.
- No. 3: Bonke, J. *Choice of foods - allocation of time and money, household production and market services*, September 1992.
- No. 4: Grunert, K. G. & Ellegaard, C. *The concept of key success factors: Theory and method*, October 1992.
- No. 5: Harmsen, H. *Determinanter for produktinnovationssucces*, November 1992.
- No. 6: Grunert, K. G., Nissen, L. & Wildenhoff, L. *Do Danish food companies analyse their competitors*, February 1993.
- No. 7: Bech-Larsen, T.: *Overvejer forbrugerne emballagens funktions- og miljøegenskaber, når de køber fødevarer?* Februar 1993.
- No. 8: Lassen, J. *Food quality and the consumer*, March 1993.
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- No. 10: Plichta, K. *Technological opportunities and paths of development*, September 1993.
- No. 11: Kvistgaard, M., Plichta, K. & Rasmussen, O. *Den danske brødindustri - struktur, teknologi, forskningsbehov*, Oktober 1993
- No. 12: Grunert, K.G., Brunsø, K. & Bisp, S. *Food-related life style: Development of a cross-culturally valid instrument for market surveillance*, October 1993
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- No. 14: Grunert, K. G. & Grunert, S. C. *A comparative analysis of the influence of economic culture on East and West German consumers' subjective product meaning*, November 1993.
- No. 15: Langhoff, T. N. *The internationalization of the firm in an intercultural perspective*, November 1993.
- No. 16: Grunert, K. G. & Brunsø, K. *Market surveillance for the food industry*, November 1993.
- No. 17: Harmsen, H. *Tendencies in product development in Danish food companies - Report of a qualitative analysis*, February 1994
- No. 18: Martensen, A. *A model for marketing planning for new products*, February 1994.
- No. 19: Bech, A. C., Engelund, E., Juhl, H. J., Kristensen, K. & Poulsen, C. S. *QFood - Optimal design of food products*, March 1994.
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- No. 21: Andersen, E. S. *The evolution of credence goods: A transaction approach to product specification and quality control*, May 1994.
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- Søgaard, V. *Farmers, cooperatives, new food products*, May 1994.

## **MAPP conference papers**

- Baadsgaard, A., Gede, M. P., Grunert, K. G. & Jensen, N. N. *Lagged life cycle structures for food products: Their role in global marketing, their determinants, and some problems in their estimation*, First International Multidisciplinary Conference on Food Choice, Brussels, July 27-30, 1992.
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Furthermore there are a number of project papers, which are not available to the public.

*The MAPP programme consists of the following 15 projects*

1. Strategic Planning and Innovation Capability in the Danish Food Sector  
Morten Kvistgaard & Kirsten Plichta, Copenhagen Business School
2. Innovation Capability as a Key Success Factor  
Klaus G. Grunert & Hanne Harmsen, The Aarhus School of Business
3. Quality Certification as a Key Success Factor in International Marketing of Food Products  
Niels Jørgensen & Erik Lund, Business University of South Jutland
4. Definition of the Sales Potential for a New Food Product to be Launched on Home or Foreign Markets  
Anne Martensen & Kenneth Kæregaard, Copenhagen Business School
5. Primary Producers and Product Innovation in the Food Industry  
Villy Sjøgaard, University Centre of South Jutland
6. Controlling Processes of Production to Guarantee Process Characteristics Demanded by Consumers of Food Products: Paradigms and Danish Experiences  
Esben Sloth-Andersen, Aalborg University Centre
7. The Role of the Distribution System in Product Innovation  
Hanne Hartvig Larsen & Nick Norman Jensen, Copenhagen Business School
8. Prototyping in the Danish Food Industry  
Preben Sander Kristensen & Elsebeth Holmen, Aalborg University Centre
9. Product Quality and Consumer Preferences: Assessing the Optimum Design of Food Products  
Kai Kristensen, Hans Jørn Juhl, Anne Bech & Erling Engelund, The Aarhus School of Business; Carsten Stig Poulsen, Aalborg University Centre
10. Product Innovation and Packaging in the Food Industry - Environmental Consequences and Consumer Reactions  
John Thøgersen & Tino Bech-Larsen, The Aarhus School of Business
11. The Consumer as Agent in Relation to Research and Development in Food Technology  
Erling Jelsøe, Birgit Land & Jesper Lassen, Roskilde University Centre
12. Households' Choice of Foodstuffs with Different Kinds of Preparation  
Jens Bonke, University of Copenhagen
13. The Cultural Dimensions of Food Consumption and the Implications for Strategy Formation and Implementation in Small and Medium-sized Danish Companies  
Dominique Bouchet, Josette Andersen, Søren Askegaard, Tage Koed Madsen & Per Østergaard, Odense University
14. Market Surveillance Systems for the Food Sector  
Klaus G. Grunert & Karen Brunsø, The Aarhus School of Business
15. Identification of Key Success Factors  
Klaus G. Grunert & Elin Sørensen, The Aarhus School of Business