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The evolution of credence goods in customer markets: exchanging 'pigs in pokes'

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1 Introduction

When consumers buy products like for instance food products, they make choices by comparing price and quality among alternatives—e.g. a standard product and an animal-welfare oriented variant. The choice between product variants is influenced by the available information channels and the related uncertainty of information concerning different quality characteristics. For instance, the amount of visible fat of a pork chop wrapped in plastic can immediately be inspected and the taste of pork can be experienced, but the previous welfare of the dead pig is to most consumers a matter of loosely grounded belief. The consumer can to some extent improve his or her level of information by consulting experts or by choosing to buy from well-respected retailers. But this does not remove the difference between the different types of good, since the increased information level is obtained at a cost.

Like Krouse (1990, 510) we can therefore classify different types of product characteristics according to their pre-purchase costs of quality detection (pre-costs) and post-purchase costs of quality detection (post-costs). This classification leads us directly to a classification suggested by economic theorists—starting from Nelson (1970) and Darby and Karni (1973)—namely the trichotomy of "search characteristics", "experience characteristics" and "credence characteristics":

search characteristics have low pre-costs of quality detection and thus allow the buyer to shop around and find the best-quality specimen by simple inspection;

experience characteristics have high pre-costs but low post-costs since quality information is obtained by the buyer as a by-product of use after the purchase; this information provides input to the decision making about repeated purchases;

credence characteristics have high pre-costs and high post-costs of quality detection; as a result the buyer has to rely on third-party judgements or on the seller's credentials, i.e. the undisputed record of honesty, competence and determination with respect to the quality of supply.

These three types of characteristics are summarised in Table 1, which gives a stylised presentation of differences with respect to pre-costs, post-costs, which type of consumers buying behaviour the evaluation affect, and finally examples of the different types of characteristics. An example of a search characteristic could be visible fat of a chop of pork; an example of an experience characteristic is the taste of pork under different preparations; and animal welfare of the production system that delivers pork exemplify a credence characteristic.

Although the trichotomy of "search characteristics", "experience characteristics" and "credence characteristics" seems pretty obvious, economists still use this classification only sporadically. There are several reasons for this neglect and thus several problems to solve before the concepts can be used more widely.

First of all, consumers do not buy characteristics, they buy products; and it is often these products that we would like to classify—as "search goods", "experience goods" and "credence goods". But the overall quality of a product is determined by a bundle of very different characteristics—like we saw in the

Table 1: Types of product characteristics

Characteristic	Pre-costs	Post-costs	Buying behaviour affected	Example
Search	Low	—	First-time and repeated purchases	Visible fat of a pork chop
Expedience	High	Low	Repeated purchases	Taste of a pork chop
Credence	High	High	First-time and repeated purchases	Animal welfare of pork production

case of the pork chop. It is therefore seldom that we can classify a product or a good as e.g. a clear-cut "credence good" that are "laden with" credence qualities (Darby and Karni 1973, 81 f., 84). This problem makes difficult the aggregate-level empirical investigations—from Nelson (1974) through Steenkamp (1989) to Ekelund et al. (1995).[1] In the present paper we shall try to explain how the dynamics of markets makes it impossible to come up with a neat and permanent solution to the problems of classification of goods.

The second problem with the trichotomy is that each individual product has an enormous number of characteristics that consumers do not normally bother about but which can however emerge as important experience or credence characteristics. For instance, the emergence of a new and species-transcending brain disease in British cattle (BSE) has in the 1990s contributed enormously to make the "country of origin" a core credence characteristic of ox meat—contrary to the "ordinary" situation in food products (cf. Olsen 1990). Less conspicuous shifts of emphasis on different characteristics may be endogenous to the dynamics of markets—with a cycle of a characteristic from an important credence characteristic via a status of a market standard to ignorance and fraud and finally back to a core credence characteristic. Such cycles makes problematic not only "logical" conclusions and results from aggregate-level studies but questionnaire-based consumer research. Thus we should not overestimate Steenkamp's (1989, 126 f., 184 f.) result from a study of pig-meat (gammon)—that consumers puts less emphasis on credence characteristics than on experience characteristics. It is no coincidence that other investigations (e.g. Ford et al. 1990) gives contrasting results. In the present paper we shall try to explain the differing results.

The third problem is mainly related to credence characteristics and credence goods. This problem is that while search and experience goods have been fairly easy to cope with in microeconomic theory, economists lack adequate concepts of dealing with credence goods. Here we are dealing with a concept that is little fit for comparative-static analysis—even in imaginative versions like that of Falkinger (1992). The concept seems to be calling for a more dynamical and evolutionary type of analysis. In the present paper we shall try to demonstrate how the concept can be specified through a dynamic analysis of the coevolution of household preferences, manifest product characteristics and the institutional set-up of markets and their surroundings.To make such a specification we shall combine into an evolutionary framework ideas of boundedly rational consumer choice, the characteristics approach to consumer demand and the above mentioned attempts within information economics to develop a trichotomy of characteristics and goods.[2] The main purpose of our specification is to develop the concepts of credence characteristics and credence goods in a way which is

relevant for empirical analysis and consumer policy.

2 Towards a theory of credence goods

The starting point of a theory of credence goods is not the Olympic rationality of economic textbooks but the "natural rationality" of real economic agents (Darley and Kauffman 1997). When dealing with credence characteristics, these naturally rational agents cannot even be of Sargent's (1993) kind of "boundedly rational econometricians" that "theorize, estimate, and adapt in attempting to learn about probability distributions". Instead such consumers have to *assume* that the overwhelming majority of the millions of potentially critical characteristics of all the products and services that they consume are "OK". When this assumption is clearly revealed to be wrong in a particular case, consumers can either reduce their aspirations or react—often angrily. Thus credence characteristics promotes many of the apparently irrational reactions towards uncertainty which Kahneman et al. (1982) have demonstrated. Without the application of biases and highly simplifying heuristics, consumers would simply have to make a radical reduction of the scope of their consumption.

2.1 Types of credence goods

As a direct consequence of our conception of consumer decision making, we have to make a distinction between the (small number of) credence characteristics that at any point of time are explicitly taken into account and the (large number of) credence characteristics that are (temporarily) ignored. In other words, we distinguish at a certain point of time between

manifest credence characteristics that influence the buying behaviour of a significant subset of consumers, and

latent credence characteristics that does not influence the buying behaviour but might later (re)emerge as an important element of decision making.

The consumers' selection of characteristics that deserve explicit attention is influenced by a great many factors, and we shall in the following deal with several of them. But one of these factors is so basic that we have to mention it immediately: a characteristic is only manifest if there is variety among the suppliers. If the credence characteristic has become a general market standard, consumers will forget about it. The same will be the case if there is no (explicit) supply of the characteristic.

The literature on credence goods from Darby and Karni (1973) to Emons (1997) has concentrated on goods with important credence characteristics that can neither be fully standardised nor disappear—like many of the characteristics of automobile repair and medical services. But for most goods the borderline between manifest and latent credence characteristics shows both cycles and irreversible evolution. This is likely to influence the outcome of empirical investigations like the ones mentioned in Section 1. Depending upon at which point in this process of change the empirical investigation is conducted, it will

give different results. Some studies will mainly reflect the initial period of attention, while others deal with the period where the credence characteristic can be taken as granted. Still others will reflect the subsequent period where renewed consumer interest is developing because of occasional "quality scandals", etc. Thus some studies will support Steenkamp's (1989) above mentioned scepticism towards credence characteristics while others will support Ford et al. (1990).

In the present paper we shall try to get away from the kinds of credence characteristics that show few of the shifts between manifest and latent elements in consumers' decision making. Therefore, we would like to enumerate some of the alternatives to the classical case of bundled credence characteristics where repair services are coupled with expert advice of the amount of treatment is necessary. Our additional types are "hidden credence characteristics", "standardised credence characteristics" and "stochastic credence characteristics". Here is our list of definitions to which we for the sake of completeness have added the classical case of "bundled credence characteristics":

hidden credence characteristics cannot be detected by inspecting the finished good because they concern details about the production process that has little or no influence on the objective characteristics of the purchased good, e.g. because the they concern "ethical" characteristics of the process of production;[3]

standardised credence characteristics are often a large number of minimum standards which the good should live up to but which the consumer in practice is not able to control or even think about, e.g. that meat is labelled with a correct date of production and that it is not tendered by dangerous chemicals;[4]

stochastic credence characteristics emanate from experience characteristics of individual specimens which become credence characteristics because consumers draws these specimens from a probabilistic distribution; for instance, consumers would like that there is a very small probability of quality break-down due to bad (e.g. boar-like) taste of pig meat for a party;[5]

bundled credence characteristics emerge when a seller provides not only a repair service but also expert advice concerning how much treatment is necessary.[6]

A little reflection about the conditions of consumers in economic history and about contemporary decision making of consumers will reveal that the first three categories of manifest and/or latent credence characteristics are of greater importance than the last one. A glimpse of the historical evidence can be taken from old handbooks about "*Warenlehre*"—to apply the German term; a Danish example is produced by Meyer (1952). We can also study the hidden credence characteristics of exotic goods like "Persian" carpets (cf. Spooner 1986). But in the history of economic thought there is an emphasis of simpler problems. One example is a liberalist like Babbage (1989)who around 1830 accepts the government's own production of a simple product like flour because of the alternative costs of verifying "each sack of purchased flour" and of employing "persons in devising methods of detecting the new modes of adulteration which might be

continually resorted to". More recent examples can also be taken from food production.

"Ethical" qualities relating to e.g. the welfare of producing animals are typical and still more wide-spread examples of hidden credence characteristics. Here we are dealing with consumer-oriented characteristics which are specified in terms of the production process rather than in terms of the physical product. Only a well-established control system can guarantee that a food product is the outcome of a specially defined production process which may imply extra costs vis--vis dominant types of processes of production. Free-range pig meat is clearly an example of such a production-process-specified product and all the related inspection problems. If its hidden credence characteristics are latent, it is because consumers temporarily take for granted the efficiency of the quality control system.

Standardised credence characteristics, in our sense, reflect the fact that practically all goods are complex systems used for complex applications. In principle, they could be described by a vector of characteristics which has a very large number of elements. Even if all these potential characteristics were easily discernible to the buyer (which they are not!), the testing of them all is practically impossible. Therefore, they all cannot be manifest characteristics, i.e. properties which are important for the buyer's actual choices in a given period. The alternative is that the seller integrates a large number of important properties of a good or brand into a single characteristic (like: "basically satisfactory" or "according to present-day standards"). Such a composite characteristic is clearly a credence characteristic since it is very costly and probably impossible for any buyer to know all the standards and even more to check whether a specimen of the good is satisfactory with respect to them all. It is, for instance, practically impossible for the buyer to check whether pig meat is satisfactory with respect to all the standards concerning its nutritional, gastronomic, hygienic and ethical properties. If the buyer has no trust in the seller of a good with many minimum standards, the buyer will normally find a more credible seller rather than try to cope with the individual elements of the set of standards. If there is a trustful relationship, the standardisation of most issues allows both parties to concentrate their attention on a few important issues (see Andersen 1991).

Probabilistic properties define a huge class of credence characteristics which can best be introduced by analysing the concept of brand. The brand or trademark is to a large extent explained by the fact that the variation of the levels of quality characteristics of a commodity tends to be less between specimens from a single producer-seller than between specimens from different sellers. Both experience characteristics and hidden credence characteristics of individual items of the brand can be seen as random variables with a certain dispersion around a central value. Alternatively, we may define the breakdown of a specimen of a brand as a discrete property (cf. Smallwood and Conlisk 1979, 2). Some of the units are experienced to fall below the minimum value of a quality characteristic during a period of use and they can be considered to have suffered from "breakdown". For example, pig meat may be revealed to have unsatisfactory properties. Given a definition of breakdown, the buyer may simplify the judgement of probabilistic quality of a brand with respect to a particular characteristic. Instead of dealing with mean and variance of the characteristic, he or she may consider probabilistic quality as the probability that a single spe-

cimen of the brand does not suffer from breakdown during a normal period of use. This stochastic property is often a core credence characteristic although an individual breakdown can be experienced.

2.2 Credentials of sellers

Until now we have just defined credence goods as goods with core characteristics that can, at best, be known by consumers through costly procedures. When a seller gives a product the predicate "is-as-good-as-standard-pork-but-from-free-range-pigs", then it is practically impossible for the buyer to control whether the seller is right. The reason is both that the specification is seldomly fully formalised and that many of the quality characteristics of the specification (like the genetic, hygienic and "ethical" qualities) are very difficult to detect and judge by the individual buyer.

Under such—and similar—circumstances buyers may be supplied with goods that do not live up to their specifications and thus with random error or direct fraud. The buyers even know that suppliers have incentives to cheat because it is normally costly both to use e.g. animal friendly production methods and to control that these methods are actually used. Therefore, the consumer is likely to ask whether e.g. a specific cut of pork really comes from a free-range pig. When it comes to answering the question, the buyer has to rely on the seller and/or the overall quality control system. But the buyer does not need to build the confidence in the seller on blind trust. Instead the buyer may show credence, i.e. confidence based on external evidence.

Goods with important credence characteristics will only be demanded to any significant degree provided that sellers are able to show credentials which demonstrate that the buyers have reasons to believe their quality claims. If the buyer cannot trust the seller's quality claims (e.g. about "free-range pig meat" produced according to certain rules), then the buyer faces high information costs and for this reason the transaction might be rejected. If the buyer, on the other hand, have credence in the seller, then the evaluation of the credence characteristics is quite straightforward: the claims from a credible supplier should not be questioned. Credence goods are goods for which the buyer's decision making is dominated by concerns about credence characteristics and thus about the seller's credentials.

Such credentials may be of several different kinds. The supplier may demonstrate heavy commitment to a credence good by creating a corporate brand supported by conspicuous advertising; this may demonstrate to buyers that the supplier will do very much to avoid "quality scandals" and the resulting loss of goodwill (see Aaker 1991). A third party may also evolve: government may want to protect its citizens and/or the exports of the nation; a non-governmental control organisation may develop either to reap a profit from the control work or to promote its (environmental) goals (see Vroom 1987). In the United Kingdom the former solution is dominant while in the Netherlands free-range pigs has to a large extent been developed by an independent control organisation which is financed by levies related to its control and branding service (Philipsen 1995).

2.3 Supply of credence goods in customer markets

Market-based credence goods mainly exist in a type of market where customers are normally loyal to a particular seller from whom regular purchases is made. To understand the prospects and problems of a credence good like free-range pig meat, it is helpful to develop a model of such a customer market like it is was initiated by Chamberlin (1962) and summarised in relation to information economics by Phelps (1985, Ch. 15). In the customer market model both firms and customers are characterised by incomplete information and knowledge. Thus they can be characterised by Simon's (1982) notion of "bounded rationality". This means that each participant in the market has to rely on his/her beliefs of desires and capabilities of the other participants and on expectations about the current and future industry conditions.

An existing firm in a certain customer market is known by its present customers and some of the potential customers. When a new firm decides to establish itself in the market, probably no or only a few customers know it. In both cases the firm can invest in an expansion of its customer base. The costs of the investment are manyfold. Basically, to attract new customers the firm has to offer a particularly good bargain. The investment is likely to be substantial because consumers' reaction in customer markets cannot be expected to be quick. But it is exactly this inertia of behaviour that allows the firm to calculate its return on the investment of acquiring new customers. There might also be benefits from the change in the long-term behaviour (e.g. increased loyalty) of existing customers.

The problem of asymmetric information with respect to credence characteristics can be resolved by developing the model of the customer market. In such a market, a customer is normally loyal to a particular seller. The underlying assumption is that the seller is also loyal by delivering products with a satisfactory quality-corrected price. If this is the case, there is only a small probability that the customer will shift to another seller. Instead the buyer enjoys buying from a trustworthy seller who makes satisfactory deliveries although the customers seldom make the costly ex ante or ex post checks which are necessary to see whether their assumption is correct (Barzel 1982).

The buyer normally prefers well-established credence goods from well-reputed sellers. The underlying assumption is that the long-term evolution of both product specifications and the population of suppliers has demonstrated which claims about credence characteristics are false and which are truthful. However, since the detection of false claims with respect to credence characteristics is, by definition, rather seldom, the selection against incorrect claims is quite difficult. In fact, this selection presupposes some degree of altruistic or cooperative behaviour among buyers.

To be more specific, it is not enough that a customer who have detected false claims stops buying from the customary supplier. The customer must also—like in Hirschman's (1970) scheme—give "voice" to a dissatisfaction, either as a warning to the seller and/or as an attempt to make other customers participate in a punishment of the seller. The reasons for this behaviour are only partly of the rationalistic type; even a deep-felt emotion of anger of being cheated may play a role. Given the customers' problems of quality detection and their costs of establishing a new and better relationship, the reactions to (apparently) false claims are normally sluggish and erratic (cf. Bikhchandani et al. 1992). Often

the seller will be given the benefit of doubt, before the customer finally decides to exit the relationship and/or to advice others not to buy "pigs in pokes" from the seller.

The behaviour of the customers means that the seller can reckon with an accumulated stock of customers as a clientele with a relatively high and stable propensity to continue the relationship. This stability means, for instance, that the seller may engage in mark-up pricing or quality reductions, and thus the seller may obtain pure profits for a while. The seller may also engage in an investment-like effort to expand the stock of customers (or their individual purchases) by pricing, advertising, or quality improvements. The returns to such an investment is represented by the present value of the expected future purchases of the new customers (or the expected increase in the purchases of the old customers). Similarly, the loss of customers will show up as a decrease in the seller's "goodwill", its customer capital (cf. Aaker 1991, on "brand equity"). The reason for this "disinvestment" will often be an insufficient response to a new competitive situation in the market.

The many different strategies available to buyers and sellers mean that a customer market is never in a stable equilibrium. Instead, an apparently stable equilibrium will sooner or later be undermined by behavioural change. The problem is not least that the buyers' propensity to exit customer relationships depends on their perception of the distribution of the sellers' quality-corrected prices. If there is very little perceived variance in the market, then the buyers' propensity to exit will be low (but not zero because of emotional reactions). In this situation the variance of the behaviour of sellers is likely to increase because of the large set of possible strategies for sellers. Some sellers will exploit the situation by increasing their quality-corrected prices while others will try to persuade their given clientele to buy more by increasing the quality and scope of their product portfolio. Through these reactions, the customer market becomes more varied, and the subsequent perception of this variety increases the incentive for buyers to shift between sellers. This increase changes the situation for the sellers who have to behave in a way which decreases the variance of their behaviour. And so the story starts once more...

2.4 The evolution of credence goods in customer markets

A seller in a customer market cannot vary the commodity characteristics of its products freely. On the contrary, it is part of the implicit contract between the seller and its customers that the seller continues to deliver at a stable or decreasing quality-corrected price. Since an innovation per definition involves a degree of novelty, such an innovation with respect to the seller's core products will create uncertainties and doubts of the effect on the quality-corrected price. Thus the basic tendency of a customer market is conservative rather than innovative. It is much easier for the seller to analyse the reactions of actual and potential customers to vertical rather than horizontal product differentiation (Lancaster 1979, 26–29). To avoid uncertainty, the seller is likely to play down the fact that its innovation is horizontal and instead emphasise its vertical aspects.

Some of the conservatism of customer markets can be overcome if the seller has a large and evolving portfolio of both vertically and horizontally differentiated products. In this perspective, the outcome of the innovation process is

considered as more or less random variants which might and might not succeed. One task related to this portfolio approach is how fast the success or failure of a new commodity specification should be determined. Another task is to obtain a higher probability of success than can be reached if the novelties are drawn randomly from the immensely large set of possible commodity specifications. Here a wide-spread heuristic is to keep a large number of quality dimensions fixed at well-known values and only vary a few in a random way or because of suggestions from the customers. Thus the strategy is to introduce horizontal differentiation which is only slightly differing from vertical differentiation, as in the case of free-range pigs. However, since the differentiation process takes place over a broad front of products, its long-term effects may be quite considerable.

Such a strategy of differentiation is especially used by an innovation-oriented retailer with multiple shops. The customers are able to consider the retailer's behaviour in many markets and dimensions while most producers of branded food products are focused on a limited portfolio of credence goods. To the extent that the buyer emphasise credence qualities to an increasing degree (because of a deteriorating knowledge of food products as well as an emphasis on animal welfare), the buyer favours a retailer who is sufficiently large to establish its own quality control system and to influence the innovative activities of her suppliers. Such a retailer may also chose to present the novelties under its own label rather than with the brand name of the producer. This increases the possibility that it may obtain a large part of the eventual profits from the novelty; at the same time it increases its customer capital because it can attract many new customers and because it can strengthen the relationship with existing customers.

This situation is likely to change as other sellers will try to regain their lost customersoften by developing similar quality control capabilities. Furthermore, free-riding sellers will behave as if they had sufficient control capabilities although they are avoiding control costs. This forces control-oriented sellers to find means of distinguishing themselves from the free riders, e.g. by formalising their control criteria. As a side effect, the control system becomes more systematised and easier to imitate. The original quality problem may in the end be reduced to a well-defined grading or well-defined minimum standards. Thereby, the credence good is changed to a search good or an experience good, as pig meat was conceived a few years ago in many industrialised countries. The increasing focus on e.g. salmonella has changed this perception so the credence dimension is again important for the consumer. The beef sector with the "mad cow" disease (BSE) illustrates the importance of the credence aspect even better.

It is, however, not normally the whole product type (e.g. free-range pig meat) but an individual quality characteristic which undergo such a quality life cycle. The whole product type undergoes a series of quality life cycles which together create its long-term evolution. This evolution can be schematised by considering the seller's product specification, i.e. the set of objective characteristics of the product (and its mode of production) which influence its perceived utility for one or more of the actual and potential customers. However, this specification is not complete in any absolute sense. At a certain point of time, t, the seller has to do with a specification in terms of the n_t quality dimensions which have already been recognised as more or less important. In this n_t dimensional space, a commodity specification is a single point, $(c_1, c_2, \ldots, c_{n_t})$, which specifies how the product is described in terms of all the dimensions.

It can often be shown empirically that n_t is increasing in the long run. This raises a contradiction because the cognitive capabilities of the individual buyer are limited and more or less constant (cf. Simon 1982), and because the buyer is only able to give a very limited amount of attention to most product groups. A solution to this contradiction is to say that the number of characteristics which are explicitly taken into account in the decision-making of the buyer of a certain product, m_t, is bounded upwards. For ordinary food products the number is smaller than some maximum, $m^{\max}$, a maximum which might even be shrinking over time (due to the increasing cost of time and memory in the household production function). Thus there is a tendency that $n_t \ll m_t$. The rest of the quality characteristics of the product are only taken into account as a part of a set of the $k_t = n_t - m_t$ minimum requirements which the seller in a customer market is normally assumed to take care of. In the marketing consumer literature the consumer is assumed to solve the problem with attributes left out in the information processing by combining relevant "chunks" of characteristics and relating them to e.g. a brand name (Solomon 1996, 105). In other words, the buyer presupposes that most important problems with respect to product quality have been taken care of by means of minimum requirements, although he/she only knows a few of them.

The changing importance of individual characteristics can be modelled in terms of the quality life cycle. Initially a newly recognised characteristic is subject to much interest among buyers and sellers but the end result of the competitive process is that it is transformed from a decision-making parameter to a part of the conjunction of minimum requirements which is normally taken for granted. This disappearance is part of the typical life cycle of most quality characteristics, and it explains why key success factors in a certain customer market are changing through time.

However, as the conjunction of minimum requirements through time becomes more and more complex, the quality control costs of sellers will be increasing while the probability that buyers disclose the dishonesty of sellers will decrease. As a result, the market is increasingly open to attacks from free riders. In this situation, civil law and government regulation may obtain an important function as means of stabilising the market. By securing the upholding of large parts of the complex of minimum requirements, the regulation may help to free the attention of sellers towards a competition on new credence characteristics.

3 A stylised case: free-range pigs in the Netherlands

3.1 The product

Free-range pigs has recently emerged as a relatively important phenomenon in various European food markets, after its initial development in the United Kingdom in the beginning of 1980s. Because of its animal welfare characteristics the underlying production system is often seen as an "ethical" alternative to industrialised pig production.

The production system makes free-range pigs very visible in the landscape, and they have also been considered as an interesting subject for mass media. But in relation to free-range pork we are clearly dealing with a product with

hidden credence characteristics as well as standardised credence characteristics and stochastic credence characteristics. At present is it sufficient to remark that free-range pigs deviate from regular pig meat by process characteristics that cannot be controlled by the consumer. There are not yet develop measurement methods which can tell whether a pig carcass originates from a conventionally raised pig or a free-range pig. Even it there were effective testing methods, they would probably be too costly and too impractical for consumer use.

In the following we shall describe the stylised facts about the emergence and evolution of free-range pigs in the Netherlands. This case is developed and documented at much greater lenght by Philipsen (1995) and Philipsen and Andersen (1998).[7] These underlying studies are partly based on trade journals, partly on interviews with experts and decision-makers.

3.2 The pioneering phase

We have earlier mentioned that Steenkamp (1989) found that Dutch consumers put little emphasis on credence characteristics of food products. According to our theory of credence goods one should be very cautious when trying to generalise such a result beyond a particular period and a concrete set of goods. This is emphasised by the evolution of free-range pig production in the Netherlands.

The rules for free-range pig production was defined in 1983 by a collaboration between on the one hand the most important Dutch organisations concerning environment, animal welfare and consumer interests and on the other hand the organisations for free-range pig farmers and alternative butchers. These parties also started a control organisation in 1985—the ISC, Internationale Scharrelvlees Controle (International Free-Range-Meat Control). The establishment of this control system was influenced by a scandal concerning Dutch free-range egg production. The problem was that it was revealed that up to 25% of the eggs sold under the "free-range" label was produced in the traditional intensive way by "battery hens". This scandal made Dutch consumers very sceptical towards free-range products, including free-range pork. Therefore, ISC had to establish a much more trustworthy control system.

The production of free-range pigs under ISC control met a general interest in the Dutch media. In those days the sale of free-range pig meat was limited and the main reason for the survival of the ISC was the "free advertising" through interviews in the mass media—and thus a limited investment in creating a customer base in customer market terms. The central message of ISC was to obtain more room for pigs in the stables, access to outdoor areas, allowing the pigs to act according to their natural behaviour, controlling veterinary treatment including the use of medicine, demands about foodstuff, demands about when to separate the piglets from the sow etc. The spread of these messages helped to build up an image of being an alternative to the existing meat industry.

But in the period from 1985 to 1988 the ISC, free-range farmers, and free-range butchers were also perceived as too "alternative" in a more negative sense by the established slaughterhouses, meat processing companies and supermarkets. These established groups talked of "people with windmills in their backyard" who should be ignored by "serious" farmers and butchers. The "non-serious" image was partly caused by the rather large proportion of non-professional farmers and butchers and by the technical problems with producing free-range pigs, the pork of which did not meet the normal standards for pork.

The main problem in this period was the general bad quality of the free-range pig meat. The meat was, for example, too fat. The ISC rules were not made to provide for a good eating quality. They were only intended to secure certain process characteristics—the credence aspects of the "hidden quality" type. As a consequence the quality, measured by the mean and variance of fat content and other product characteristics, was below that of meat from conventionally-raised pigs.

3.3 The expansion phase

The image of free-range pig production changed dramatically in 1987–1988, when Albert Heijn, the biggest supermarket chain in the Netherlands, showed interest for pigs produced in an animal friendly way. From this point of time things moved faster. And in 1993 there were in the ISC system 150 pig farmers delivering 60.000 free-range pigs, 150 butchers, 450 supermarket outlets, 7–8 slaughterhouses and 7–8 meat processing plants. This indicates the considerable volume of production, manufacturing and distribution that the ISC organisation was monitoring 8 years after it was started. But even for Albert Heijn free-range pig meat seems to have been one out of the two most important new products in the fresh meat market in a five-year period.

Albert Heijn's is generally considered to be the trend setter in the grocery sector in the Netherlands and as having a market leader position both generally and concerning pork. Its involvement in the development of free-range pig products relates to the company policy about "wide choice" and Albert Heijn's focus on alternative food products. The selling of free-range pig meat gives consumers with a critical attitude towards regular pork an option. That consumers do not need to buy this kind of meat in a special butcher shop also creates an image of Albert Heijn being comprehensive. Finally, the profile of the typical free-range pig consumer—"higher social class, higher income, a higher level of education and a better job" is attractive to Albert Heijn, because of its business strategy of a high quality image and not a discount concept. The typical consumer buying free-range pig meat is assumed to be part of the core consumer group of Albert Heijn. Steenkamp and Ophuis (1987) characterise typical free-range pig meat consumers as "consumers who on the one hand are not willing to become vegetarians but on the other hand reject the way pigs are usually raised". So if Albert Heijn did not sell this type of meat, some of its customers would go to a "scharrelslager" (free-range meat butcher) to buy it it rather than not buy meat or buy some other kind of meat.

Before Albert Heijn could sell ISC free-range pig meat, a control system suited for supermarkets had to be developed. In this phase, Albert Heijn's contribution towards developing the free-range pig concept was to extend the possible sales channels from "scharrelslagers" to supermarkets. The ISC was asked to find a solution to the confidence problems related to the process of butchering. Albert Heijn has in-store butcher shops in their outlets, but it neither wanted to, nor could in practice sell only free-range pig meat. It, furthermore, wanted to stock free-range pig meat in the same cooling counters as regular meat, because then free-range pig meat products could be handled in the same way as other products in the store, thus saving money under logistics and control. So the ISC had to offer another control option than the one that kept the different kinds of meet completely separate. This led to a concept of

pre-packed free-range pig meat. The sliced meat is "Controlled Air Packed" (CAP) and an ISC label is put on top. The free-range pig meat is sliced and packed at the meat processing plant affiliated to the ISC and then distributed to the supermarket outlets. If a supermarket wants to cheat, it would need access to a CAP packing machine and ISC labels, making it much more difficult to cheat with pre-packed meat than with unpacked meat. Albert Heijn and the other supermarkets selling free-range pig meat also have very little economic incentive to cheat, because if it were exposed, the costs of re-establishing their image would by far exceed the benefits of cheating.

But Albert Heijn also still had problems with free-range pigs and pork and to solve these problems it had to cooperate with parties involved in the Dutch free-range pig production and distribution—more specifically with on the one hand a foodstuff and pig breeding company (De Heus) and on the other hand a minor slaughterhouse and meat cutting company (Grif-Bo).

The problem was that free-range pig meat is a special product. Its sales volume is presumed to be small and it is probably also a slow-moving product compared to standard meat cuts. To avoid waste, Albert Heijn was interested in a product with a long shelf-lifetime. This is assumed to be one factor which influenced Albert Heijn's decision to choose Grif-Bo as its supplier. The process of developing the free-range pork production process took about two and a half years from the time the first free-range pork was delivered to Albert Heijn to the product reaching a stable and acceptable quality level measured in terms of a high rate of accepted carcasses. The debugging process concerning the major problems was a frustrating and expensive process for all parties. There where huge problems with the search and experience quality dimensions in the start: the pigs were to fat or to lean, to heavy or to light. The pigs were not right, the foodstuff was not right and a great part of the farmers was characterised as "bad". It was a period characterised by loosing money for all the involved companies because the low meat quality was paid below the normal pork price.

The innovation problems were solved where the necessary resources and capabilities were located and the outcome was communicated to the other parties. The feedback from distribution to slaughtering, from slaughtering to farmers, foodstuff and breeding company has been essential for the development of pre-packed free-range pork. Albert Heijn has been involved in the identification of pre-packed free-range pork as a potentially important market. It has been involved in identifying problems with the pork and setting up a technical standard for acceptable pork. Albert Heijn has also been involved in de-bugging problems after the pre-packed free-range pork was launched. Finally, Albert Heijn has been involved in long term planning concerning the product life-cycle. It has been possible to estimate production relatively precisely one year in advance. So the increased production and sale in more Albert Heijn stores has been co-ordinated and planned by all three companies. The financial strength of Albert Heijn has also made it possible to wait the 6 years from when the product was launched in 6 stores in 1988 until it was able to be sold in all Albert Heijn outlets in Autumn 1993.

3.4 Shifting emphasis

The locus of the innovation activities have clearly changed through the development of the free-range concept. The factors which have influenced the direction

and intensity of the innovation activities have changed in the process. So have the tensions between the innovation system and the control system. The two most important events were when (1) the egg scandal was solved by the establishment of ISC and (2) when Albert Heijn wanted to sell pre-packed free-range pork and ISC had to create a new control system from the slaughterhouse to the supermarkets to handle the credence problems. This point to the conclusion that tensions between the innovation system and control system both can arise from changing consumer demands, but also from interest conflicts/fraud in the production and distribution chain. This means that the system's ability to overcome breakdowns in quality depends, among other things, on whether there exists a common economic advantage for the companies involve in the production system to overcome the problems.

4 Conclusions

In this paper we have seen how most traded goods have a smaller or larger number of important qualities which cannot be revealed by inspection or ordinary use. These qualities which are difficult or impossible to detect but which nevertheless play a role for the buyer, are called credence characteristics. Credence goods are goods for which the buyer's decision-making is dominated by concerns about credence characteristics. They clearly differ from search goods and experience goods in many economically relevant respects. However, although the concept of credence goods was introduced by Darby and Karni in 1973, it has only sporadically been treated in serious analytical work.

There are three major types of credence characteristics. In the first case, credence characteristics cover the "hidden" qualities of a specimen of a good. Among such characteristics, the most conspicuous are the ones which relates to aspects of the production process (like free-range pigs). In the second case, each specimen is supposed to live up to a large set of minimum standards which—especially as a whole—are very difficult to test for the buyer. In the third case, a specimen is considered to representing a brand which have important probabilistic characteristics.

The application of individual characteristics can be modelled in terms of a quality life cycle. Initially the characteristic is subject to much interest among buyers and sellers but the end result is a minimum standard with respect to the particular characteristic. This minimum standard is added to the other minimum standards which characterise the particular product. Products with a long history (like many food products) have shown design trajectories which include large numbers of individual quality-characteristic life cycles. The market-level evolution of credence characteristics can be modelled as an interplay between consumers and e.g. retail chains with complex portfolios of products.

Empirical examples suggest core issues for economic organisation in relation to credence goods. There is a need of further studies which imply a reinterpretation of important parts of economic history as well as of present-day problems. To promote such studies we sketched out the Dutch case of free-range pigs and pork. In this case an independent control organisation—backed by government—was used to inspect the credence characteristics concerning animal welfare and thus to guarantee these quality claims towards the consumers. This system was described attractive some length, but we stop in the expan-

sion phase. Therefore, we have not described a full life cycle of a credence characteristic.

Instead of speculating about the full life cycle, we shall mention that the free-range pork system face and similar systems are likely to face serious challenges in the long run. Some of these challenges can be related to the national brand level and to the international level (European Union). At the national product brand level the major challenge comes from pork brands of conventionally raised pigs with an added animal welfare profile. If consumers trust the animal welfare claims in these products and the products are cheaper to produce compared with free-range pork then it is likely the investigated free-range pork brands will be outperformed in the long run. Changes in consumer perception of what is meant by animal welfare or by focus on other aspects of animal welfare could create tension with the existing—and difficult to change—rules and free-range pig concepts. At the international level a future common EU legislation for free-range pork and thus the establishment of an EU standard would create problems if the standard differ substantially from the present free-range pig concept and especially if it requires changes in the production systems at the farm level. The investments at the farm level typically have the longest pay-back period in the production chain and thus highest degree of commitment to this kind of production.

Notes

[1]Even the simple distinction between search goods and experience goods becomes blurred when we move from standard examples to a classification of all products in order to start econometric studies. Here Nelson (1970, 320, 1974, 739) makes groupings of, e.g., nondurable product groups based on whether or not sampling is destructive. Food and most other products can only be tested by destroying the sample and are therefore called experience goods while clothing and related products are search goods that can be tried out. We could add that the doctor's advice concerning a medical treatment is a credence good since it to some extent concerns a unique event. The advantage of such a crude classification is that it creates a taxonomy that is clearly independent of the subsequent testing of hypotheses on different types of goods. But it is of dubious value in more concrete studies and it removes any attention from the evolution of the characteristics of goods. From a concrete point of view it is, e.g., not obvious why relatively well-defined goods like sugar and butter are placed as experience goods while footwear and knit goods are search goods (even in relation to Nelson's use of data for the US in the 1950s).

[2]Nearly twenty years ago Smallwood and Conlisk (1979, 3) remarked that the assumptions underlying evolutionary modelling in the Nelson and Winter tradition is more appropriate for consumers than firms. It is especially clear that consumer behaviour is likely to be more routine based than firm behaviour. Nevertheless, evolutionary modelling has continued to have an extreme supply-side bias. Actually, from the models recorded by Nelson and Winter (1982) to the models surveyed by Nelson (1995) we find an emphasis on process innovation that excludes any role of the consumer. It is only very recently that this situation has started to change.

[3]Hidden credence characteristics are dealt with by e.g. Steenkamp (1989), Bowbrick (1992) and Andersen (1994).

[4]Standardised credence characteristics are implicitly dealt with by David (1987) and Bowbrick (1992).

[5]Stochastic credence characteristics underly the evolutionary analyses by Smallwood and Conlisk (1979) and Andersen (1994).

[6]Bundled credence characteristics are the classical case from Darby and Karni (1973) to Alford and Sherrell (1995) and Emons (1997).

[7]Peter et al.'s (1998) use a condensed version of case of free-range pigs based on Philipsen and Andersen (1998).

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