INFORMATION, RISK AND TRUST
IN THE FOOD CHAIN: EX-ANTE VALUATION
OF CONSUMER WILLINGNESS TO PAY
FOR BEEF QUALITY INFORMATION USING
THE CONTINGENT VALUATION METHOD

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Abstract: The purpose of this study was to examine what kind of information flows are required to ensure quality and safety in the food chain for beef, and who should produce that information. Studying the willingness to pay of consumers makes it possible to determine whether the consumers consider the quantity of information available on the safety and quality of beef sufficient. The empirical scope of the study was restricted to beef, because the beef labelling system enables reliable tracing of the origin of beef, as well as attributes related to safety, environmental friendliness and animal welfare. One of the main findings of this study was that the majority of Finnish consumers (73%) regard increased quality information as beneficial. These benefits were assessed using the contingent valuation method. The results showed that those who were willing to pay for increased information on the quality and safety of beef would accept an average price increase of 24% per kilogram. The results showed that certain risk factors impact consumer willingness to pay. If the respondents considered genetic modification of food or foodborne zoonotic diseases as harmful or extremely harmful risk factors in food, they were more likely to be willing to pay for quality information. The results produced by the models thus confirmed the premise that certain food-related risks affect willingness to pay for beef quality information. The results also showed that safety-related quality cues are significant to the consumers. In the first place, the consumers would like to receive information on the control of zoonotic diseases that are contagious to humans. Similarly, other process-control related information ranked high among the top responses. Information on any potential genetic modification was also considered important, even though genetic modification was not regarded as a high risk factor.

Keywords: *food safety, traceability, quality cues, contingent valuation, beef.*

Tiivistelmä: Tässä tutkimuksessa selvitettiin millaisia ja kenen tuottamia informaatiovirtoja tarvitaan laadun ja turvallisuuden todentamiseksi elintarvikeketjussa. Kuluttajien maksuhalukkuuden määrittämisellä selvitettiin, onko naudanlihan turvallisuutta ja laatua koskevaa informaatiota kuluttajien mielestä riittävästi saatavilla. Tutkimuksen empiirinen osa rajattiin koskemaan naudanlihaa, koska naudanlihan merkintäjärjestelmä tarjoaa mahdollisuuksia jäljittää luotettavasti lihan alkuperä sekä turvallisuutta, ympäristöystävällisyyttä ja eläinten hyvinvointia koskevia ominaisuuksia. Tämä tutkimus osoitti, että suurin osa suomalaisista kuluttajista (73 %) kokee hyötyvänsä uusien naudanlihan laatua ja erityisesti turvallisuutta kuvaavien laatutietojen lisäämisestä. Tutkimusmenetelmänä oli contingent valuation –menetelmä. Ne kuluttajat, jotka ilmoittivat maksuhalukkuudestaan, maksaisivat laatutiedosta noin 24 prosenttia naudanlihan kilohintaan lisää. Tutkimuksessa selvitettiin maksuhalukkuutta selittäviä tekijöitä ja osoitettiin, että tietyt riskitekijät selittävät kuluttajien maksuhalukkuutta. Jos vastaajat pitivät geenimuuntelua tai eläinperäisiä zoonooseja haitallisena tai erittäin haitallisena riskitekijänä elintarvikkeissa, sitä todennäköisemmin he olivat valmiita maksamaan laatutiedosta. Mallien tulokset vahvistavat sen käsityksen, että tietyt turvallisuuteen liittyvät riskitekijät lisäävät maksuhalukkuutta laatutiedosta. Tulokset osoittivat myös, että turvallisuuteen liittyvät laatuvihjeet ovat merkityksellisiä kuluttajille. Suomalaiset kuluttajat kaipaavat nykyisten pakkausmerkintöjen lisäksi tietoa tilavalvonnoista eläintautien suhteen, lääkeaineiden käytön valvonnasta ja eläinten geenimuuntelusta, vaikkakaan geenimuuntelua ei yleisesti pidetty kovin suurena riskitekijänä elintarvikkeissa.

Avainsanat: *elintarvikkeiden turvallisuus, jäljitettävyys, laatuvihjeet, contingent valuation, naudanliha.*

ACKNOWLEDGEMENTS

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Terminology

Adverse selection: A market condition caused by asymmetric information, whereby only inferior products enter the markets.

Asymmetric information: Information that is unevenly divided between the various economic actors. For example, in the food chain, a producer often possesses more information on production methods than an actor who purchases raw materials for further processing. The disadvantages caused by asymmetric information may be mitigated through actions such as production contracts and quality certification of operation and processes.

Consumer surplus: The difference between the total willingness to pay of an individual and the price of a given good.

Contingent valuation (CV): A research method used to study consumer willingness to pay for a given good. The name of the method derives from the fact that consumer willingness to pay is dependent, or contingent on a proposed scenario.

Dichotomic question format: A binomial question format that elicits "Yes" or "No" responses. Also known as the referendum question format.

Free rider: A consumer who may be able to avoid paying for the consumption of a given good.

Hypothetical bias: The difference between the willingness to pay quoted in a survey and the willingness to pay occurring in reality.

Market failure: The inability of the markets to achieve an optimal allocation of resources.

Moral hazard: A change in the division of a risk between various actors, with a consequent change in individual human behaviour; for example, taking out car insurance may influence an individual's car driving behaviour.

Neoclassical economics: In general, economics refer to the tradition of Neoclassical economics. An economic analysis generally relies on three premises: individual preferences, minimal resources, and the maximisation of individual utility.

Pareto efficiency: The state of an economy is Pareto efficient when the welfare of any single individual cannot be improved without negatively affecting the welfare of another individual. The term was coined after Vilfredo Pareto, an Italian economist.

Public good: A pure public good can be consumed by everybody, regardless of the payer.

Public sector: In economics, a decision-making sector besides industry and households. At its widest, the public sector is considered to include public bodies such as states and municipalities as well as public institutions and companies.

Random utility model (RUM): This model assumes that the factors affecting individual decision-making processes remain unknown to some extent; thus, a random error term, ε, is included in the model (McFadden 1974).

Utility: In economics, the satisfaction of needs or welfare impact caused or facilitated by the use of resources.

Value: (a) A relative measure of importance or desirability used in the comparison of at least two goods.

In Neoclassical economics, values reflect individual preferences. In short: price times quantity.

(b) In psychology, values are reflected in individual attitudes. Values are more permanent than attitudes.

Welfare: The sum total of individual levels of utility in a society.

1   INTRODUCTION

1.1   To food safety policies through food safety crises

The safety of food in the food chain has become an increasingly interesting issue to consumers and the media. It has also become a source of concern, as the amount of information on the risks related to food safety continues to expand. Food safety and risks emerged as topics in the 1980s, when contaminated hamburgers caused deaths in the United States. In Europe, the first major food safety crisis began with the spreading from Britain of BSE (Bovine Spongiform Encephalopathy), or the so-called mad cow disease, which was associated with Creutzfeldt-Jakob disease (CJD) in humans. Discoveries of high levels of the carcinogenic substance dioxin in food, coupled with threatening images of global contraction by humans of zoonotic diseases such as most recently the avian influenza, have contributed to the fact that *concepts of risk and safety have become permanent issues in discussions on food and quality*.

In Finland, the level of consumer trust in the functioning of the food chain is good, and for the time being, no major crises related to food safety have occurred. A single case of a cow with BSE was diagnosed in Finland in 2001, but its impact on the consumption of beef remained short-lived. In spring 2006, avian influenza affected the consumption of poultry, but again its impact in Finland remained noticeably more moderate than elsewhere in Europe, in the absence of actual diagnosed cases in production animals (PTT Katsaus 2006).

To improve food safety in Europe, and to restore consumer trust, the European Commission presented important measures in its White Paper on Food Safety[1] (COM 2000). Proposed actions included the creation of the European Food Safety Authority (EFSA) and reinforcement of the "farm to table" approach in food legislation. The White Paper emphasised the responsibility for food safety by all stakeholders in the food chain, and called for improvements in the traceability of feed, food and their ingredients. Responsibility for food safety increasingly shifted from the public sector to the hands of the operators in the food chain. The White Paper further empha-

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[1] In White Papers, the European Commission outlines official proposals for European Union action in specific political areas. A White Paper is published after a Green Paper has first been published to prompt public discussion and an EU consultation process. Published Papers are available at: http://europa.eu/documents/comm/index_en.htm

sised *the consumers' need for clear and accurate information on the quality, composition and potential risks of food*.

In Finland, the "farm to table" quality process was launched in 1999, when a commitment was made to improve the quality of products and production processes through the creation of the National Quality Strategy. Shifting the responsibility for quality increasingly to all stakeholders in the food chain underlines the importance of conveying reliable and accurate information through the entire food chain up to consumer level, in order to create economic incentives for the production of quality food. This, in turn, requires good traceability for food and its ingredients. Companies and corporations have made improvements to the traceability of food, e.g. by implementing in-house control systems. At the moment, various product data systems are also rapidly being developed. At the beginning of 2005, the European Union General Food Law on traceability (EC/178/2002) came into effect. For beef, the requirements for traceability and notification of origin are even stricter than this directive stipulates.

There are various reasons why public control of food markets is needed, e.g., through legislation. Attributes and characteristics related to the quality and safety of food are so-called public goods. In economics, the term refers to the attributes that the markets often fail to price correctly, and that have no value on the market. In practice, it means that neither food safety nor a product's food safety attributes have a market price, and thereby the market mechanism alone does not function efficiently enough to contribute to the production of quality products. On the markets, quality products do not fetch higher prices, even if their production costs are higher. In economics, this phenomenon is termed market failure.

In this case, market failure is caused by a lack of relevant information on product quality, and as a consequence the standard of quality of the goods on the market declines. Because the markets fail to contribute efficiently to the quality of food, it is necessary for the public sector to take action to ensure a minimum standard for the quality of food on the market.

In addition to the quality control and standardisation implemented by the public sector and operators in the food chain, information remedies can be used as a political measure. One form of information remedy or guidance is package labelling. On food markets, package labelling can include both mandatory labelling regulated by the public sector, and producers' own voluntary labelling, which strives to highlight the qualities that make their product unique in comparison with rival products.

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1.2   Objectives of the study

Although the quantity of information on the safety and quality of food in the food chain is constantly growing, there has been no significant increase in the amount of information available to the consumers, even though developments in the food industry are aimed at better consumer orientation. Consumers' informational needs have been researched very little.

The purpose of this study was to examine what kind of information flows are required to ensure quality and safety in the food chain for beef, and who should produce that information. Studying the willingness to pay of consumers makes it possible to determine whether the consumers consider the quantity of information available on the safety and quality of beef sufficient. This was also a clear and concrete contribution of this study.

The empirical scope of the study was restricted to beef, because the beef labelling system enables reliable tracing of the origin of beef, as well as attributes related to safety, environmental friendliness and animal welfare.

The objectives of this study were as follows:

(I)   To determine the average consumer willingness to pay for increased quality and safety information in the beef supply chain.

(II)   To identify factors contributing to consumers' willingness to pay, such as perceived risk and trust in the operators of the food chain.

(III) To determine the type of information that consumers require in addition to current package labelling.

(IV) To determine which operators in the food chain produce the most reliable information.

1.3   Concepts of food safety and quality in food economics

Public goods

The objectives of this study formed a basis for identifying quantitative, economic values through a political change, *i.e. the provision of information on the safety and quality of food*. This phenomenon has two mutually dependent dimensions: information on one hand, and food safety on the other. Information on the attributes of a given product is in itself a good. Furthermore, the two dimensions share a trait: both are public goods.

A characteristic of public goods is that they can be consumed without affecting their availability to other consumers, and their rights of ownership can be neither precisely determined nor restricted. Information is usually

considered a pure public good. This attribute can be regarded as one of the reasons why markets fail to produce enough information on the safety and quality of food (Henson and Traill 1993). If information and food safety are interpreted as pure public goods, with insufficient supply, public authorities must assume the role of providers of public goods.

On the food market, a specific attribute of information is that it is consumed as a "by-product" of food. A product that resembles a public good but whose rights of ownership can be restricted to a specific consumer group is called a club good (Antle 1999). In such a case, instead of merely producing information, public authorities must create a framework favourable for the production of information, thus enabling consumers to receive and use it (Antle 1999).

Quality and safety as attributes of food

Food quality has grown into a very comprehensive concept which, in addition to the physical quality attributes of food, covers aspects such as service and the quality of the production process (MMM 2000). Food safety has become an increasingly important attribute. Caswell (1998) defined food safety as a specific attribute. Table 1 presents a classification of the most important food quality attributes, including safety (risk factors), nutritional, sensory, process-related, usage and packaging attributes.

Finnish consumer studies on the quality of food paint a colourful picture of the consumers' perceptions of quality. In the early studies, the highest-ranking components were freshness and a Finnish origin (Taloustutkimus 1998). Later interviews conducted by Finnish food-industry experts demonstrated that consumers consider food safety a basic priority, to which all other attributes are secondary (Viinisalo and Leskinen 2000).

For meat products, the highest ranking selection criteria are price, origin, quality and freshness (Finfood Lihatiedotus 2008). Aspects related to the production of food and animal welfare do not rank among the main selection criteria. On the other hand, the quality of animal feed is increasing in importance. However, it must be noted that for many of these attributes, consumers have no available information for use as product selection criteria. In terms of information on the origin of food, consumers have better selection criteria for meat products than for other foodstuffs.

Table 1.   *Classification of food quality attributes*

I Food safety attributes

Heavy metals	Drug residues
Pesticide and herbicide residues	Food additives
Naturally occurring substances	Bacteria and viruses that cause food

II Nutritional attributes

Calories	Fat
Fibre	Vitamins
Proteins	Carbohydrates

III Sensory attributes

Freshness	Tenderness
Taste	Texture
Appearance	

IV Process-related attributes

Animal welfare	Pesticide and herbicide use
Environmental impact	In-house control and quality
Occupational health	Traceability

V Usage attributes

Purpose of use
Storage

VI Package attributes

Package materials	Suitability
Package labelling	Disposability

Positioning of the subject of the study among the field of food economics

In the field of food safety, "Economics of Food Safety", edited by Caswell (1991), was among the first publications. Studies related to food safety have often drawn on the theories and methods of environmental economics, such as risk, uncertainty, asymmetric information and negative externalities (Wiegand 1994). Of the methodological approaches, the most common are econometric models based especially on qualitative variables such as the cost of illness method, and on valuation methods used for non-market

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goods, such as the contingent valuation method. In the 2000s, the CE or choice experiment method has been among the most commonly used methods in the valuation of non-market goods.

In Europe, economic research into food safety issues increased noticeably in the 1990s, propelled by food safety crises. European research into food safety mostly focuses on product marketing related consumer surveys aimed at investigating the connection between quality cues and perceived quality (Bredahl 2003, Henson 1996, Henson 2000, Henson and Northern 2000). Issues related to food safety and labelling have been studied by Angulo et al. (2005), Verbeke and Viaene (1999a), and Verbeke and Viaene (1999b).

In Finland in the late 1990s, food safety also became a subject of study from an economic perspective. Siikamäki (1997) applied the contingent valuation method to assess the willingness of consumers to pay for reduced use of pesticides. Maijala and Peltola (2000) used a cost-benefit analysis to investigate the economic impact of the *Salmonella* control program on the food chain. Virolainen and Niemi (2000) have studied the economic effects of genetic modification in Finland. In addition, the overall economic effects of food-transmitted zoonotic diseases have been examined by Kilpeläinen et al. (2004).

Closely related to food safety are the risks perceived by consumers, and their trust in the operators in the food chain. In Finland, trust or perceived risks have been investigated by Aakkula et al. (2005), Piiroinen et al. (2004), Viinisalo and Leskinen (2000), and Järvelä (1998), among others. Issues related to quality and social responsibility in the food chain have been examined by Forsman-Hugg et al. (2006), among others.

1.4   Structure of the study

Chapter 2 discusses the traceability of food in the food chain, with special emphasis on the traceability of beef using the beef labelling system.

Chapter 3 examines quality and quality signals using various theoretical frameworks, applying the theories to the operation of food markets. The provision of quality-related information in particular has an impact on the operation of food markets, as well as market failure. Chapter 3 also discusses cues available on food quality, and consumers' perceptions of quality. The end of Chapter 3 cites studies on the impact of risks on consumer choice process, and ways to acquire further information.

Chapter 4 describes the concepts derived from welfare economics that are essential to consumer willingness to pay. These concepts underlie the method of the study, i.e. the contingent valuation method. This chapter also introduces the contingent valuation method, as well as the operationalisation of consumer willingness to pay.

Chapter 5 presents the data of the study together with findings on the factors related to the consumers' selection and purchase of beef. Chapter 5 also includes the empirical results on the use of beef, selection criteria, perceived risks and trust in the operators in the food chain.

Econometric modelling of consumer willingness to pay as well as the estimation results are described in Chapter 6.

The discussion section in Chapter 7 concludes the study.

Chapter 8 presents a summary of the study in Finnish.

2 TRACEABILITY AND INFORMATION IN THE FOOD CHAIN

2.1 Requirement for traceability in the food chain

In its White Paper on Food Safety, the European Commission proposed political actions to ensure a high standard of both public health protection and consumer protection. The Paper states that in order to cover the entire food chain, a food safety policy must be based on a "farm to table" approach. The primary responsibility for food safety falls on feed manufacturers, farmers and food business operators.

As a specific action, the European Commission called for improvements in the traceability of animal feed, production animals, food and ingredients. Feed and food manufacturers and operators are responsible for ensuring their ability to recall from the market any contaminated products, if they are hazardous to consumer health. Food business operators must also keep sufficient records on suppliers of raw materials and ingredients, as well as product delivery destinations. In terms of traceability, the principle is that an operator must be able to trace raw materials at least one step forward and one step backward in the food chain. The Directive does not necessarily demand so-called internal traceability, or information on the ingredients of a given food.

The principles formed the foundation for the General Food Law of the European Union (EC/178/2002). Article 18 describes food traceability requirements. The Directive also sets out requirements for the responsibilities of food and food business operators (Article 17), recall of food and foodstuffs, and communication with authorities and consumers (Articles 19-20). The food and feed traceability regulations came into effect on 1 January 2005. For some foodstuffs and their attributes, even stricter traceability requirements apply than those specified in this general Directive. These include organic foods, genetically modified foods, beef, chicken eggs and vegetables (Suojanen and Haikonen 2004).

2.2 The labelling system and traceability of beef

The Finnish Bovine Register was the first officially ratified bovine register within the European Union. In use since 1995, the Finnish Bovine Register has also found wider applicability in farm animal production planning as well as the monitoring and payment of animal-specific subsidies. To stabilise the beef markets shaken by the BSE crisis, the European Union created a beef labelling system (EC/1760/2000, EC/1825/2000, 1203/2001/MMM). The primary objective of the labelling system is to introduce transparency and traceability to the beef production chain. The labelling system enables beef to be traced back to the production farm, or even the production animal.

The labelling of beef begins at the birth of a calf, with the insertion of yellow eartags into each ear. The tag bears a unique bovine identification number that stays with the animal throughout its life. The owner reports the details of an eartagged calf to the bovine register, maintained by public authorities. The sale of an animal from one farm to another is always reported to the register. The last report made by the owner details the slaughterhouse where the animal was sent.

In one eartag, the animal has a number that facilitates the tracing of information, e.g., on its feeding, as well as any illness and medication. The unique bovine ID follows the carcass through the slaughterhouse and all the way to the meat counter. In the store, it is mandatory to identify the origin of both domestic and imported beef both on the labels of pre-packaged products and in the immediate vicinity of products sold over the counter. Because the beef labelling system also provides the means for gathering reliable data on the feeding and care of production animals, the scope of this case study was restricted to beef.

2.3 Traceability between operators and retailers in the food chain

Efficient Consumer Response, or ECR, is the term used for the traceability procedures adopted by the food industry and retailers for the best interests of the consumers. ECR is an industry strategy designed to eliminate unnecessary costs and make operation more consumer-oriented. In 2003, the retail sector and food industry began to implement this strategy by building a product data system that allows product data to be stored in the databank by using European Article Number, or EAN codes. The system was taken into use in September 2004. By January 2008, some 420 suppliers had signed

up, and some 66,000 products had been entered into the system. Companies can enter their product data electronically into a single shared databank called the Sinfos Article Master Data Pool, where the data is available to all retail groups[2]. This makes the communication of product information from the industry to the retailers efficient. This product data system illustrates the fact that current IT and communications technology already provides the capability for efficient transfer of extensive amounts of data compiled in primary production, e.g. during the beef production process, to the industry and retail levels.

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[2] For more information on the Sinfos Article Master Data Pool, see http://www.sinfos.fi (in Finnish).

2.4 The National Quality Strategy of Finland and ELATI Quality Data System Network

In autumn 1997, the Finnish Ministry of Agriculture and Forestry established a Quality Board. This Quality Board was tasked with, among other things, the creation and management of a national competitive strategy based on the quality of Finnish food and foodstuffs. A crucial element in this strategy is the involvement of every stakeholder in the Finnish food chain, in line with the "farm to table" approach. The vision of the Finnish Quality Strategy for the Food Sector was crystallised as follows: the production of safe and high-quality food by drawing on national strengths. Using systematic quality processes, food will be produced in a consumer-oriented, feasible and competitive manner, respecting humans, animals and nature (MMM 2000).

In 2001, the first review of the quality strategy (Silén 2001) showed that in primary production, extensive quality improvement actions were still in their initial stages. However, the food industry perceived the concept of quality through the quality of both products and operation processes. Naturally, the retailers held the most consumer-oriented view of quality. Regardless of improvements in quality processes, consumers still see few results from these development efforts. According to Silén (2001), the food chain requires a higher degree of quality awareness in general and consumer focus in particular.

As part of the National Quality Strategy, a food quality data system called ELATI was developed. Its primary task is "to prove the origin and production methods of Finnish food and foodstuffs to consumers in Finland and abroad, and to provide information to the various stakeholders in the quality chain as a basis for continuous development of operation" (Seppänen 2000). The system also facilitates the following actions to gather and process scattered quality information from the food industry, in order to create a more accurate view of the standard of quality of the Finnish food industry, and to observe developments in quality processes. Reviewed summaries can be efficiently sent to the bodies responsible for the communication of information, so that consumers receive increasingly better information on food quality.[3]

Rapid development towards increasingly consumer-oriented operation is currently taking place throughout the food chain. On one hand, the traceability of products allows for safer products with better quality, while, on the

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[3] For further information on the ELATI Quality Data System Network, see: http://www.laatuketju.fi (in Finnish).

other hand, more efficient control of the food chain allows for savings in costs.

Chapter 3 looks at how consumers form their perceptions of food quality. The chapter also discusses the reasons for the potential failure of the markets to operate efficiently enough to contribute to product quality, and the impact on product quality caused by the unavailability of sufficient information on the markets.

3 CONSUMER ORIENTED QUALITY AND QUALITY ATTRIBUTES IN THE FOOD CHAIN

This chapter examines the dynamic process by which consumers form their perceptions of the quality of food products. In this context, quality is therefore mainly defined from the consumers' perspective. If the whole food chain strives towards consumer orientation, the most significant quality cues affecting consumer choice processes should then appear as observable attributes in the buying situation.

Chapter 3.1.1 positions the research on food safety and quality among the fields of economics. It explains how essential the available amount of information is for the efficient operation of the markets. The economics of information are applied as the theoretical framework here. This chapter introduces a classification of quality attributes of goods based on the ability of consumers to estimate quality levels prior to purchase, or before or after consumption. The lack of information on the food market entitles public authorities to control the minimum quality level of food products. Chapter 3.1.3 introduces the market conditions that justify such control actions.

The paradigm[4] of information economics describes information and market conditions, but fails to provide an exhaustive explanation of consumer behaviour under these conditions. Chapter 3.2 examines the supply of quality cues in the food chain, since consumer perceptions of quality are based on extrinsic quality cues. In food science, there are many complementary theoretical frameworks on consumer behaviour. Chapter 3.2.1 presents the most extensive of them, Grunert's (1997) Total Food Quality Model. Chapter 3.2.2 introduces the concept of risk: how consumers form their risk perceptions, and how these individual perceptions affect the actions consumers take to alleviate perceived risks, such as gathering more information on the goods at issue. Confidence in the information suppliers is considered

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[4] One of the most influential philosophers of science in the twentieth century, Thomas Kuhn, argued that science evolves by jumps from one paradigm to another, therefore not only by changing a single theoretical framework using the scientific procedure of argumentation and proof. The use of the word 'paradigm' here illustrates that information economics represents a fundamental change in the prevailing Neoclassical paradigm within economics (Stigliz 2002). An example of this paradigm shift occurred in 2001, when the Nobel Prize in Economic Sciences was awarded to George A. Akerlof, Joseph E. Stingler and A. Michael Spence, for their pioneering analyses of markets with asymmetric information.

in Chapter 3.2.4. A condensed summary of the hypotheses to be empirically tested is presented in Chapter 3.3.

3.1 Food safety and quality in the context of economics

3.1.1 Imperfect information and consumer choice

Neoclassical microeconomics maintains an implicit assumption that under conditions of perfect competition, economic actors have perfect information. According to this assumption, all sellers and buyers know the quality properties of the products sold on the market. This assumption holds if the quality of the goods is easily observable and without costs. If good and bad quality attributes are differentiated in the market, the prices of the goods will reflect the differences in quality. However, if quality information is too expensive, the buyers and sellers are unlikely to share the same information on quality.

Akerlof's model (1970) showed that markets fail in the presence of information asymmetry. He argued that if information asymmetry exists between sellers and buyers, bad quality ultimately drives out good quality from the markets. This phenomenon is called adverse selection, and it leads to a lower quality level on the markets. Therefore, if quality-related information asymmetry exists in a free market situation, only lower quality is offered for sale.

Becker (2000) applied this example to the operation of the meat market. In today's meat chain, raw materials may be purchased from further and further away, whereby information on the characteristics of the meat is not as easily available as when the meat is directly bought from local producers. The production of high quality foodstuffs generates higher costs, and if higher quality fetches no additional price on the markets, only inferior products enter the markets and overall product quality will deteriorate. This means that the quality of the products for consumption also declines. However, consumers might be willing to pay more for higher quality, thus compensating for the higher production costs, if the differences in quality were efficiently communicated to them.

Important progress was made in the framework of information economics when goods were classified into search, experience and credence goods, based on how consumers evaluate their quality attributes. Firstly, a search good is one whose quality is determined before purchase (Stigler 1961). For example, in the case of food products, buyers can examine attributes such

as colour, structure or extrinsic defects. Secondly, an experience good is one whose quality is determined after purchase on the basis of taste and composition (Nelson 1970, 1974). If we consider food safety issues, acute foodborne illnesses caused, for instance, by *Salmonella*, EHEC and *Listeria* bacteria fall into this category. Thirdly, many of the characteristics related to the safety of foodstuffs are classified as credence attributes. The quality of a credence good cannot be determined either before or after purchase (Darby and Karni 1973, Wilde 1980).

In the case of food risks that can only be observed in the long term, it is very difficult to establish a connection between the quality of the original food product and the illness it may have caused (Henson and Traill 1993). For example, in 40% of the human cases classified as foodborne illnesses in Finland, the bacteria or virus could not be identified (Evira 2007). Many of the characteristics related to the safety of foodstuffs are classified as credence quality attributes, because the consumers cannot by themselves assess them without having to rely on the sellers or outside observers for additional information (Andersen 1994).

The availability of quality information is very important for the operation of the markets. Markets function quite well in terms of characteristics based on external observation and, to some extent, experience quality attributes. This is because consumers learn about quality after using the products. However, in the case of credence quality attributes, both private and public measures are needed for the markets to function properly, and in order to guarantee the availability and quality of the necessary information (Caswell and Mojduszka 1996).

Based on the above classification, Becker (2000) focused on the costs caused by the need to acquire more information. These costs are lowest for the quality attributes that rely on external sensory observation. Advance quality assessment of experience goods involves high costs, but these attributes can be assessed quite easily and at low cost during or after consumption. However, in the case of credence attributes, quality assessment involves high costs both before and after consumption.

3.1.2 Credibility of quality signals

As information economics illustrated, inferior product quality is a consequence of adverse selection on the markets. In this case, one solution to these problems is market signalling (Spence 1973). For example, in the food chain, stakeholders with information superiority might signal through actions

or agreements that they do not intend to take advantage of the situation. Consequently, this mitigation of information advantages strengthens the credibility of given information.

The information structure of a market situation can be defined as follows: information is perfect when the buyer has complete knowledge of the quality of the products, and this information can be observed with certainty. Perfect information is also termed noiseless information (Phlips 1989). Information may also be incomplete, yet at the same time it can be noiseless. In many cases, available information may be both incomplete and imperfect. In many market situations, information is partly incomplete and noisy, meaning that signals cannot be observed with certainty (Phlips 1989).

Next, this definition of the information structure is applied to food safety issues on the food market. A feature of food safety is that it is practically impossible to detect all hazards in all food lots entering the food markets. In addition, elements of quality information may go out of date. An example of this is bacterial contamination, which might take place at various points in the food chain. Therefore, it can be argued that the structure of quality information in the food chain may be incomplete and imperfect.

The structure of quality information highlights the need to identify food safety hazards and the phases in the food chain where the risks can be diminished. This is a normal routine in the risk assessment process. It is very important to identify and delimit the risks to the various stakeholders in the food chain. For example, some quality properties only originate at the beginning of the food chain, such as the use of antibiotics and animal hormones on farms, and the resulting quality information does not change later in the food chain. In this case, the core function of the information structure is to convey information from this particular point forward, and this quality information remains unchanged later in the food chain. For microbiological risks, however, the information structure is more complicated because contamination can occur at various points in the food chain. If this is the case, it is essential to diminish risks starting from the very beginning of the food chain, and to increase consumer information.

One problem with quality signalling is that it may lead to a so-called moral hazard. This means that after sending quality signals, the market actors may change their behaviour. To guarantee the credibility of quality signals, the contents of the contracts between the market actors are vital. Producers themselves form a potential source of information, since they usually know the quality they deliver, but private claims should be proven credible. If a company's claims were associated with its economic activity, this information would be more credible (Ippolito 1986). Thereby, a possible loss of

corporate reputation combined with resulting business losses prohibits the exploitation of informational advantages (Klein and Leffler 1981).

Markets may fail to produce quality signals as well as actual quality. Anania and Nistico (2003) employed three scenarios to analyse how producers and consumers can change their behaviour based on the credibility of public regulation as a substitute for the lacking information and trust. In their definition, trust refers to the situations where consumers make their choice based on an act of faith in the producer.

The existence of the markets for credence goods is made possible either by the reputation of the sellers, or a production process certified for quality by a third party such as the public authorities or an external quality board. This guarantees a specific standard of quality and provides a substitute for the lacking information and trust. Results showed that for premium quality producers, public regulation is a better option, because, while imperfect, it allows the existence of markets for higher quality products. The model also explained why consumers are willing to pay higher prices: high quality markets offer higher minimum prices.

In terms of information and labelling, market failure may occur in many ways. It may manifest itself as exploitation of labelling and brands. In economics, this is the so-called free-rider problem. For example, the forgery of a label of origin may dilute consumer confidence in the label. Freely-operated markets may also produce too much information. Oversupply of information may generate artificial differences between products, whereby a specific product is groundlessly promoted, compared with other similar products. Information overload and incongruousness of information may also confuse consumers. Manufacturers often have an information advantage in terms of both quality and quality signals. In some cases, information requirements may also become an obstacle for small and medium sized companies, because quality information may be too expensive to produce (Henson 2000).

3.1.3 Food quality and measures of the public sector

The public sector, including food control authorities, has strong grounds for action when adverse selection occurs (Tuomala 1997). The aim of the public sector is to correct or mitigate consequences of the above described market imperfection. The public sector can use various political instruments to alleviate these market imperfections. These market interventions can be classified into two main categories: public measures such as legislation (e.g., beef

labelling system, traceability) and mandatory labelling (e.g., country of origin, "use by" date), and private measures such as the producers' proprietary quality labels, in-house quality control systems and third-party quality certification.

Magat and Viscusi (1992) listed many public measures for controlling the quality of goods on the market. Firstly, if a specific risk is non-existent or insignificant, the public sector should not intervene in the functioning of the markets. Secondly, if the risk is high enough to call for immediate intervention, the public sector may ban the sales or marketing of risky products or services. As such, this is a very rapid and effective response to problems such as food safety on the markets. Thirdly, a more moderate public measure is to set acceptable risk levels by means of legislation. This can be directed to the control of the quality of the good itself, or also to the implementation of operational quality standards, such as mandatory in-house control systems in the food industry. Legislation is easily focused on specific quality problems, but as a remedy for market imperfection, it is naturally a slow process compared to a sales ban.

One of the weaknesses of legal actions is that they require abundant societal resources. In Finland, food control authorities spent 30 million euros in 2002 (Niemi 2002), or approximately 6 euros per Finnish resident. However, according to Niemi's results (2002), the Finnish municipal control authorities actually require additional financial resources.

The fourth option available to the public sector is informational guidance or remedy. In this case, the role of the public sector is to increase the amount of information on the risks related to the consumption of specific products, while the final assessment of the risks involved in using the products is left to the consumers. Informational guidance can include measures such as labelling, the control of promotional claims, the provision of consumer information, and education and controls on product names (Henson and Traill 1993).

By means of mandatory labelling, the public sector can seek to elicit private information that the markets may otherwise fail to produce. The underlying motive is that this information is too costly for the consumers to obtain. Especially as regards credence attributes, mandatory labels convey information that the markets fail to produce in sufficient amounts, or with enough credibility (Caswell and Mojduzska 1996). Mandatory labelling includes information such as the "use by" date or packaging date, the fat content and the origin of the food. As regards compulsory labelling, interest in this study is focused on the labelling of beef in general and information on the origin of beef in particular.

3.2　Formation of consumer perceptions of quality and risks

3.2.1　Quality cues as basis for consumer quality evaluation

As stated above in Chapter 3.1.1, buyers cannot evaluate all quality and safety characteristics merely on the basis of search attributes. Nor does experience necessarily indicate food safety and quality characteristics with a sufficient degree of certainty. Under conditions of imperfect quality information, how then do consumers form their quality perceptions?

When evaluating the quality of food products, consumers must contend with various quality cues. Earlier studies have showed that consumers utilise quality cues such as the colour, fat content, place of purchase, appearance, absence of packaging and marination, and origin and brand (Bredahl 2003, Glitsch 2000, Grunert 1997, Järvelä 1998).

Consumer quality perception and decision-making processes have been studied in many ways, the most extensive of which has been the Total Food Quality Model (Grunert et al. 2004). This model combines several previous approaches to food quality, such as the means-end chain (Gutman 1982), the Fisbein-Ajzen attitude theory (1975), information economics (Nelson 1974, Darby and Karni 1973), theories of reasoned action and planned behaviour, and expected and perceived quality (Oliver 1980, 1993).

As shown in Figure 1, Grunert et al. (2004) divided the food quality model into two main sections: consumer behaviour before purchase, and consumer behaviour after purchase. This classification was derived from information economics, where the consumer is able to detect some quality characteristics before buying. However, most quality characteristics can only be detected after buying, as described in Chapter 3.1.1. In the consumer choice process, expectations of quality are thus based on imperfect quality information, and the term 'expected quality' is therefore used.

Expected quality consists of perceived quality cues. Consumers mainly base their perceptions of product quality on a limited number of quality cues, due to time constraints and individual quality information processing capabilities (Steenkamp 1989). Tiilikainen (1998) examines the associations between the quality attribute beliefs and perceived quality. According to Steenkamp (1989), quality cues are information that the consumer can receive and ascertain before making buying decisions. Intrinsic quality cues are related to
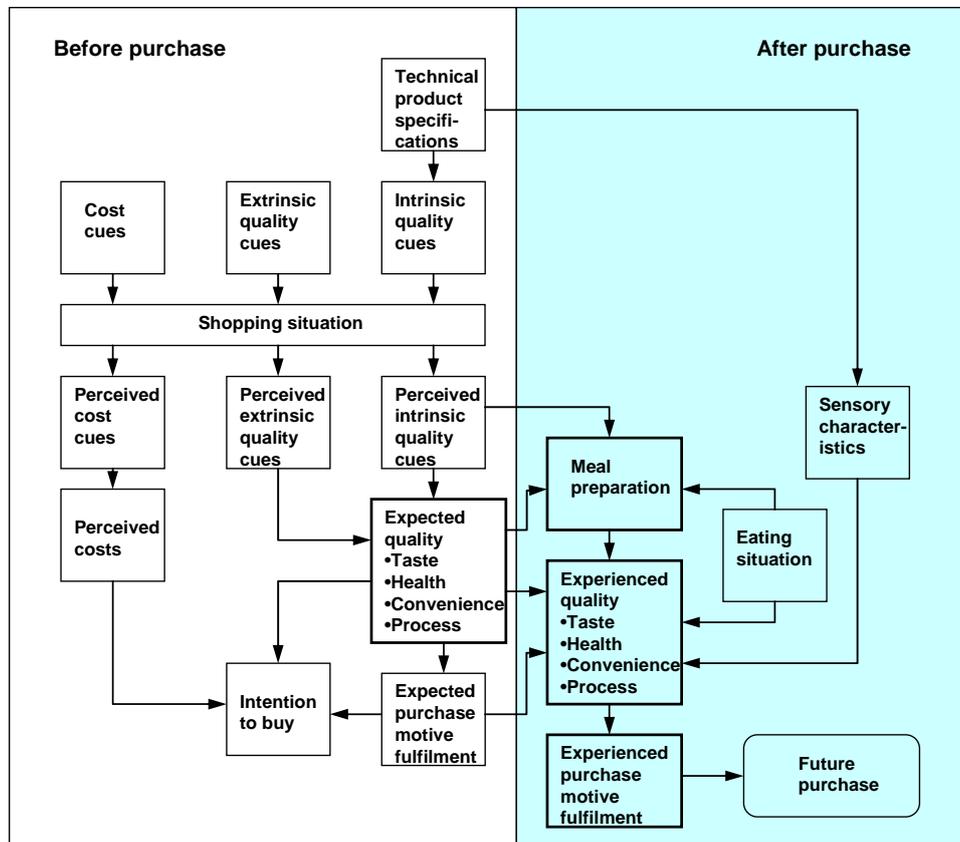
Figure 1. *The Total Food Quality Model (Grunert et al. 2004).*

physical product characteristics such as the colour and fat content. Extrinsic quality cues are associated with the product, but they are not an integral part of the physical product itself, and they can be modified without altering the actual product. Extrinsic cues include information on properties such as the origin, production processes and pricing.

Table 2 merges search, experience and credence characteristics with extrinsic and intrinsic quality cues. Clearly, it is important to focus the provision of information on the most significant indicators of experience and credence quality cues. Consumer-oriented food chains should strive to convert these indicators into extrinsic cues.

Table 2.   *Classification of quality cues*

	Intrinsic cues	Extrinsic cues
Search charac-teristics	• colour • texture • fat content • smell	• food labels: - nutritional facts (label) - origin (label) - brand - organic food label - price - "use by" date - packaging date • packaging
Experience characteristics	• taste • freshness • tenderness • acute foodborne ill-nesses	
Credence char-acteristics	• chronic foodborne illnesses • nutritional charac-teristics • process characteris-tics	

Grunert et al. (2004) stated that in the purchase situation, buyers compare expected quality and buying motives with monetary costs. In economics, the comparison of benefits and costs is called a trade-off. The trade-off situation determines the intention to buy. After purchase, consumers acquire quality experience through food preparation and usage. The experienced quality is influenced by various factors such as the product itself and its sensory char-acteristics, but also the way the food was prepared, as well as situational factors such as the time of day, type of meal, and the consumer's mood and previous experiences (Grunert et al. 2004). The relationship between quality expectations and quality experience (e.g., before and after purchase) is commonly believed to determine product satisfaction, and consequently the probability of repeated purchases.

Consumer perceptions of quality are an outcome of a process that in-volves many different phases. Bernués et al. (2003) built a conceptual model that describes the formation of consumer quality perception as a synthesis of quality supply, consumer perception of and demand for quality (Figure 2). The model reproduces the above-mentioned quality formation process based on actual and perceived quality cues and the integration of these beliefs in

PRODUCT   **CONSUMER QUALITY PERCEPTION PROCESS**
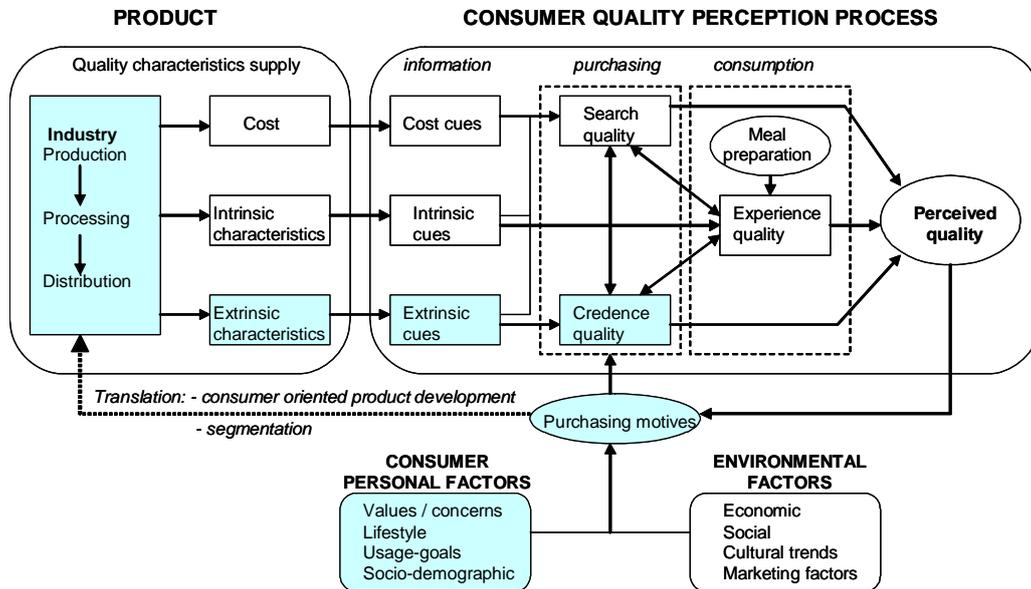
Figure 2. The supply, perception of and demand for food quality (Bernués et al. 2003).

the evaluation of total quality. Similarly to Grunert's (1997) model, buying and experience processes are divided, and the expected quality is thereby differentiated from the experienced quality and credence quality. In this model, the preparation of food is an essential part of the formation of experienced quality.

Becker (2000) highlighted the supply of quality cues and added the food industry into the model. This brought into focus the fact that it is possible for the operators in the food chain to influence the supply of quality cues provided to consumers. The model underlined the development of consumer-oriented quality in the food chain as well as the dynamic process of the formation of consumer quality perceptions.

Quality cues in meat products

The next chapter clarifies the formation of the consumer quality perception of meat products and the use of quality cues related to beef products in particular. Grunert (1997) found that consumers generally observe the quality of meat through various quality cues, such as the colour, aroma, "use by"

date, cut of meat, display hygiene, packaging, price, weight, conspicuous bones/veins, deep-frozen or fresh, marbling, visible fat, fat content, and the colour and consistency of fat. Since a time limit is present in the buying process, two factors appeared to dominate the formation of expected quality: perceived fat and the place of purchase. In other words, by choosing a given place of purchase, the consumers show trust in a specific meat seller or foodstore that is believed to recognise high quality meat.

In Finland, we still have only a few distinct quality cues in meat products that indicate credence quality and safety. Meat products are mainly bought from store shelves or meat counters without distinct quality labels. However, the use and recognition of quality brands is increasing.

If there are no distinct recognisable quality labels on the market, the price of the product can be regarded as a quality cue according to Monroe and Krishnan (1985). However, as a consequence, manufacturers may have no intentions and financial incentives to increase quality information on the market, if the product price loses its meaning as a quality cue. This may be a further reason for the failure of the markets to produce enough quality information.

Another paradox may occur if quality is too difficult for the consumers to observe. Vertanen (2001) found that in the Finnish meat chain, quality information is transmitted quite smoothly all the way to the purchasing agents at the store level, but the flow of information breaks just before consumer level. When the quality and safety differences between products are highlighted too strongly, consumers may question the quality of meat and, in extreme cases, completely reject meat products (Kola et al. 2003).

Safety-related quality cues

Among quality cues, safety is clearly a credence characteristic, which makes it especially difficult for consumers to estimate. Henson and Northern (2000) studied the process by which consumers assessed the safety of beef at the point of purchase in six EU countries. They found that at the point of purchase, information on animal feed, the country of origin and freshness were regarded as the most useful indicators of the safety of beef. In the UK and Sweden, a brand/quality assurance label was ranked higher than in the other countries involved in the study. In general, the price of the product and the name of the producer were not considered as good indicators of the safety of beef. Many studies indicate that the origin of beef is an important indicator of product safety for consumers (Bernués et al. 2003, Henson and Northern 2000, Glitsch 2000).

According to Becker (2000), credence quality characteristics in food products can be crystallised as the following list of attributes: hormones, antibiotics, fat/cholesterol, *Salmonella,* and, in beef, BSE. If information on these attributes is not available to the consumers at the point of purchase, they must rely on information from other communication channels, such as other people and the media.

Järvelä (1998) stated that for Finnish consumers, food safety is valuable in itself or as an intrinsic value, and consumers mainly perceive it through the purity and freshness of meat. In the consumers' minds, freshness is linked with the slaughter of animals, the storage times of meat, and whether or not the meat is packaged. With unpacked meat, consumers assess the origin and texture of the meat, and their trust in the seller of the meat in the store. With packaged meat, consumers can easily deduce its freshness from the packaging and "use by" dates. When prioritising safety aspects, consumers base their selection on criteria such as the domestic origin as well as the unpackaged and unmarinated state of the meat. Visual appearance and labels also help Finnish consumers to choose safe meat.

3.2.2   Risk and information

When a consumer is choosing food and estimating its safety in a store, information on its risks and their precise statistical probabilities is rarely, if ever, available. Therefore, consumer information on the risks is mainly based on hearsay and personal experiences.

The consumer decision process involves risk when the consumer cannot anticipate consequences with certainty, and some of the consequences are likely to be unpleasant (Bauer 1960). From the viewpoint of an individual, it is a question of perceived risk. Perceived risk can be divided into two concepts: uncertainty about the true probabilities and harmful consequences (Cunningham 1967). Consumer risk can also vary depending on whether it is related to a specific product category or a specific product (Bettman 1973, Dowling and Staelin 1994). The third essential definition of risk is that of acceptable risk for a given product (Kahnemann et al. 1982, Dowling and Staelin 1994).

The theoretical model of Dowling and Staeling (1994) is described below. The model formulated consumer risk perception and its effects on consumer risk-handling behaviour such as information search. The theoretical element of this paradigm is motivating from the viewpoint of this study, since it merges two frameworks: Bettman's (1979) study of consumer in-

formation processing on the one hand, and Stigler's model (1961) of information search on the other. The latter was introduced in Chapter 3.1.2. This model consists of three components:

    (I)   The factors affecting consumer risk perception;

    (II)   Perception of risks concerning specific products and product categories; and

    (III) The impact of these risk components on consumer information search behaviour.

Figure 3 describes how and in which order these concepts affect consumer risk perception and risk reduction activities.

The initial point in the risk perception model is that the consumer first decides to evaluate a product in a known product category, along with factors that are relevant for the usage situation in relation to purchase motives, as well as any previous information on the product. The overall perceived risk consists of these factors. In this model, risk is classified into so-called inherent and handled risk factors (Bettman 1973).

Bettman (1973) stated that: "Inherent risk is the latent risk a producer class hold for a consumer – the innate degree of conflict the product class hold for a consumer. Handled risk is the amount of conflict the product class is able to arouse when the buyer chooses a brand from a product class in his usual buying situation. That is, handled risk to a first approximation represents the end result of the action of information and risk reduction process on inherent risk." The first term refers then to the manner in which the consumer looks at the risk within a specific product category, and therefore the term 'product category risk' is used. The latter term refers to product specific risks when a buyer chooses a specific brand in a purchase situation. The risk concept is therefore termed 'product specific risk' (SR). If information is not available, these two concepts do not differ from each other (Bettman 1973).

Consumer risk perception is affected by many factors that vary from one situation to another. Often, these factors are related to the purchase situation and are also product specific. As an example, Dowling and Staelin (1994) mentioned the following:

    (I)   Product specific attributes such as quality and price;

    (II)   The likelihood of harmful consequences of purchase;

    (III) Buying motives; and

    (IV) Situational factors such as the place of purchase.

In this model, the essential component is the term 'acceptable risk' (AR). An acceptable risk can be of two types, namely the product category and a specific product. There is a connection between these two categories: if a consumer accepts a high product category risk, it also lowers the accept-

able risk for a specific product. To reduce the level of a risk in a purchase situation, consumers perform risk-reduction strategies such as information search.

In this model, acceptable risk determines the extent to which risk-reduction activities are made to support decision-making. In a conventional situation where the acceptable risk is higher than a product-specific risk (SR < AR), the consumer routinely conducts normal information search activities. In this case, the consumer accepts the level of risk and does not collect any extra information. If the level of risk is unacceptable (SR > AR), the consumer will undertake extra risk-reduction strategies in order to reduce a risk. The model is dynamic in the sense that the information may change the risk perception.
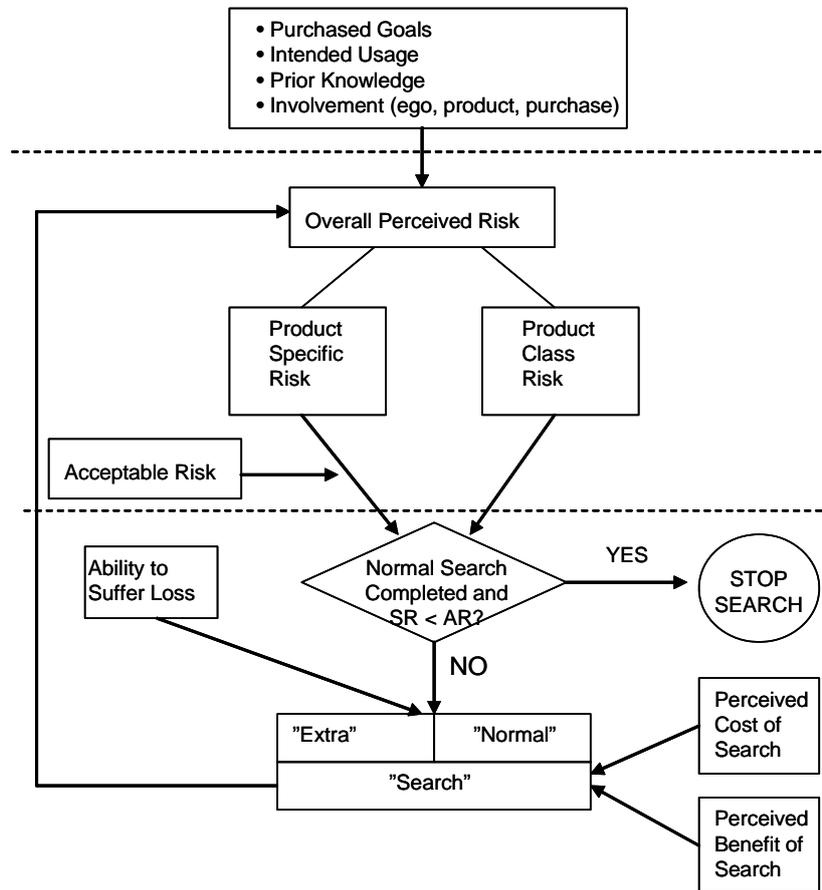
Figure 3.   *Conceptual model of the perceived risk and information search process (Dowling and Staelin 1994).*

Risk reduction strategies are divided into two categories, of which the first is connected with a normal search for information on a given product in order to acquire general product class information. The second strategy is used to reduce a specific perceived risk related to a particular product to an acceptable level. This might be achieved by collecting new information on the brand or other available brands, or by modifying the range of products in the choice set.

The likelihood of loss can be affected by obtaining information from a friend who has used the product, limiting the set of alternatives to well-known brands, or by testing the product prior to purchase. Alternatively, the magnitude of harmful consequences may be reduced by altering the purchase goals, or "insuring" against any adverse purchase by choosing a more expensive product (Dowling and Staelin 1994). The trade-off between the benefits and costs of risk reduction activities finally determines the extent of information search activities.

Studies have shown that in addition to package labelling, consumers use various information sources such as internal and external memory (Bettman 1979). Internal memory mainly arises from the consumer's own experience. External memory refers to the information obtained by listening to other people's experiences, or through the media. Becker (2000) stated that if not enough information is available on credence characteristics, consumers must use other information channels, such as acquaintances and the media.

Järvelä (1998) found that in Finland, personal negative experiences distinctly impact future purchases. In addition, such experiences are very easily shared with other consumers. This means that reports of negative experiences spread out and affect the buying behaviour of other consumers as well. According to Järvelä (1998), the role of the media is more likely to cause fear than to satisfy the consumers' informational needs.

Perception of risks concerning beef products

In Europe, a constantly growing number of studies have investigated the use of quality cues and consumer risk perception in beef products. Henson and Northern (2000) stated that the consumers' perceived ability to assess risks associated with beef will affect their risk perception; the more influential is the perceived ability to evaluate quality in the purchase situation, the smaller is the risk perceived by the consumers in that situation. Another finding was that the more experienced the consumer was, the smaller was

the perceived risk. Based on earlier literature, McCarthy and Henson (2005) summarised the most important determinants for perceived risk as follows:

- the consumer's perceived ability to assess the risks of beef products;
- interest in food preparation and beef;
- perceived product consistency;
- perceived confidence in the purchase location; and
- experience.

Consumers use various ways to reduce the risks involved in food purchase situations. McCarthy and Henson (2005) listed various risk reduction strategies in beef products. In order of importance, they are: purchase location, colour of the meat, country of origin, quality labels, fat content, label information, price, smell, texture and information on the butcher.

In their study, they divided respondents into three consumer segments according to perceived risk: sceptical (33%), cagey (53%) and optimistic (14%). A common trait of all these groups was that the choice of purchase place was a significant factor as a risk reliever. There were also significant differences in the use of risk relievers across the three segments. The sceptics perceived the highest risk in beef, and they were sceptical about their own ability to assess the quality of meat. In addition, this group used the highest number and most varied ways to reduce the level of perceived risk in beef. According to McCarthy and Henson (2005), the use of a single source of information such as a quality label may not be sufficient. Instead, multiple risk relievers are required.

3.2.3 Willingness to pay for safety and quality cues in meat products

Latouche et al. (1998) employed the contingent valuation method to study consumer willingness to pay for beef that would not transmit CJD to humans. Their question format was a mix of the bidding process and referendum method. To avoid the pitfalls of both methods, a new procedure for the implementation of the iterative bidding WTP question was introduced. The surveyor proposes an interval of monetary values instead of a precise amount. This interval is varied systematically across the sample according to the distribution of the WTP obtained in the pre-test study. The respondents answer "yes" if their WTP belongs to the interval and "no" if it does not.

The survey elicited 658 usable responses. In the survey, the primary grocery shopper in the family was interviewed, and therefore 65% of respondents were women. Willingness to pay was estimated for two different goods: meat posing a slight possible risk, such as minced steak; and supposedly risk-free high-quality beef. The quality was associated with the price: the slightly riskier and cheaper meat cost €7.62 (FF50) /kg, while the supposedly risk-free high quality beef was more expensive and cost €15.24 (FF100) /kg.

The results showed that in the case of the cheaper beef, 24% of the respondents did not want to pay anything. Even the last of the six proposed intervals elicited approximately 100 answers. The distribution indicates a large number of respondents in the highest class of bid, which suggests that the fat-tail problem had not fully been overcome.

The calculations produced an average willingness to pay value of €1.69 /kg, including zero bids. For high-quality beef, the zero responses represented about 29% of the total sample. The mean WTP reached €2.08 (FF 13.66), including zero bids. The explanatory model of the willingness to pay was tested using the parametric choice model by Hanemann (1984). The logit model had a low explanatory power ($R2 = 6\%$). However, the adopted iterative bidding procedure did not resolve the starting bid bias. The results obtained by Latouche et al. (1998) clearly showed that there is demand for safer beef products, of which the 14% and 22% additional willingness to pay values were concrete proof.

Enneking (2004) studied consumer WTP for quality and safety labels. The research data consisted of 321 interviews conducted during February and March 2002 in northern Germany. As the method of research, the choice experiment was applied to the analysed choice situation between various brands and quality and safety labels. According to the results, consumers are willing to pay approximately 20% more if the product carries a quality assurance label or, in other words, a third party has guaranteed the quality and safety of the product. The empirical findings suggested that quality labelling significantly influences the consumer choice process. The results also showed a wide variation in WTP estimates, indicating considerable preference heterogeneity across the respondents. One conclusion was that the magnitude of WTP varies across brands: for a known premium brand the WTP was €0.34 /kg (the price of the meat product was about €1.6 – 1.7). However, the WTP for the lower priced product remained at only €0.11 /kg. The study confirmed that the idea of quality and safety labels as relievers of information asymmetry in the food chain depends on the position of a given brand in the consumer choice process. For the sellers of the meat, this

means that not only can they rely on a third party certification, but they can also build trust by branding their products.

Loureiro and Umbergen (2007) also utilised a choice experiment in their study. The aim of the study was to explore the preferences of US consumers regarding food safety, country of origin labelling and traceability. A postal survey was conducted in spring 2003. A total of 632 acceptable responses were received, which translated to a response rate as low as 13%. In the survey, the respondents had to choose between two types of beef rib eye steaks and a "no choice" option. In this method, the choice set was repeated several times, and therefore the total number of responses was 3,530.

The results indicated that the label certifying the steak as inspected by the USDA food safety inspectors carried the highest premium of €16.40 /kg ($8.068 per pound[5] of steak). For other quality attributes, WTP was clearly lower: €5.22 /kg for the country of origin, €3.86 /kg for traceability, and €1.94 / kg for quality attributes. The researchers stated that although these WTP values were unlikely to be realised on the markets as such, they did point out the consumers' order of preference. Other studies (Dickinson and Bailey 2002, Hobbs 2003) have also come to similar conclusions: consumers value the most a certification that indicates safe food.

3.2.4   Trust in the suppliers of information in Finland

Traditionally, public authorities and institutions responsible for the control of food safety have enjoyed consumer trust in Finland. For example, the BSE crisis caused no hysteria among Finnish consumers, and its consequences for beef demand were much more moderate than in southern Europe. In spring 2006, the demand for poultry dropped by 50% in Italy, while the respective shift was merely 15% in Germany, and only a few percent in Finland (PTT Katsaus 2006). Below, the study of Piiroinen el al. (2004) is introduced as a context for the discussion of consumer trust in the providers of information in Finland. The study focuses on the Finnish consumer opinions on food safety and trust in the stakeholders of the food chain.

The foundations of consumer trust are societal and cultural in nature. In addition to various actors, institutions, production, distribution and consump-tion, they are also affected by the prevailing beliefs and perceptions. For the consumers, it is crucial to have confidence in the actors tasked with risk as-

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[5] One pound corresponds to 0.453 kilograms. In April 2003, the exchange rate between the Euro and US Dollar was 1.08.

sessment and risk handling activities. It is important to note that consumer trust is grounded in trust in people, i.e. human actors, instead of concepts, such as food safety.

Among other things, Piiroinen et al. (2004) investigated whether Finnish consumers trust in the safety of the food they buy and consume. With this question, they wanted to clarify consumer perceptions about the functioning of the markets. According to their results, Finnish consumers seemed rather confident, as 59% of the consumers indicated a high degree of trust in the safety of food. However, 40% of Finnish consumers indicated uncertainty about food safety. Only 1% of the respondents stated that they had very
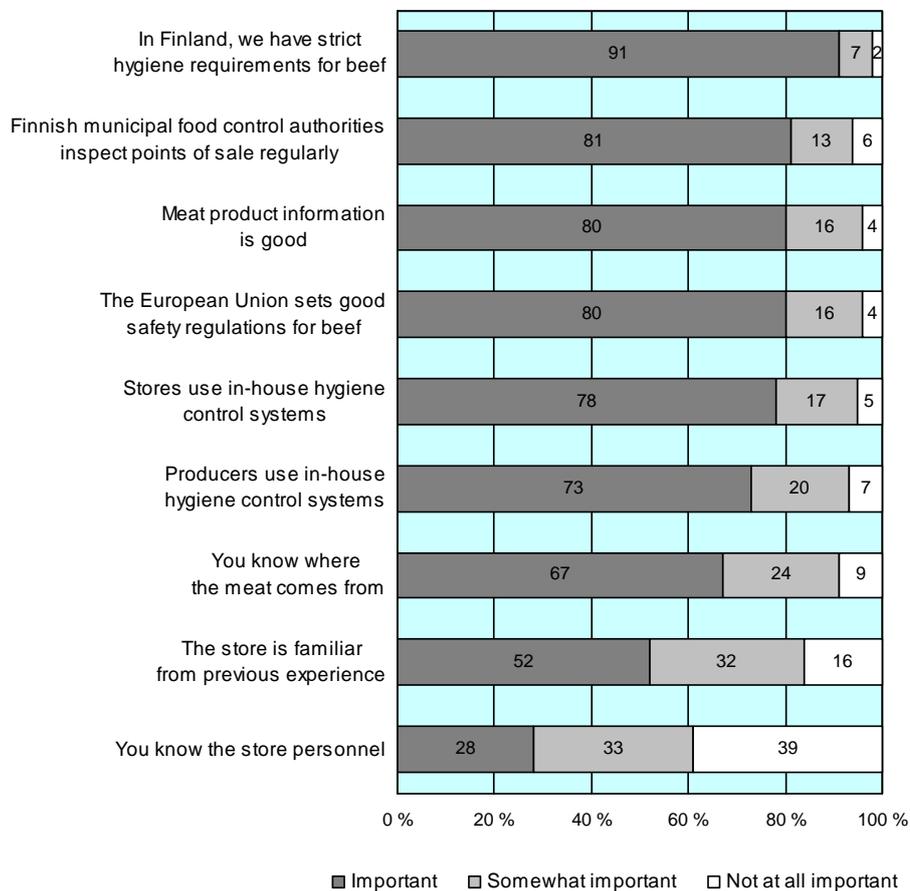
Figure 4. *The importance of quality and safety factors in the beef pur-chasing situation (Piiroinen et al. 2004).*

little trust in the safety of food. In the study, some socio-demographic differences could be found. For example, women were more sceptical than men, and the more educated the respondents were, the more they trusted in the safety of food. However, the size of the family or the number of children did not affect consumer trust.

Trust in food varies across different types of food. Regarding the safety of beef in Finland, the two most important factors for the respondents were strict meat safety requirements together with monitoring and control actions carried out by the municipal food control authorities. In third place, the consumers ranked good product information on beef products (Figure 4). It seems that consumers in Finland regard trust in different systems and regulations as a crucial element in building trust in the safety of food, while personal trust in the suppliers of meat has a minor role. Older people seem to value personal trust in shopkeepers more than younger people.

It can be stated that the level of confidence in food in Finland is high, as six consumers out of ten trust in the safety of the food available in stores. This confidence in the safety of food seems to depend on a more general sense of personal security and confidence. Finns are relatively trusting compared to other European consumers. In the event of food scandals, Finns have more trust in the credibility of the information provided by the various actors in the food chain. On average, Finns also consider that food quality has improved and regard many foods as safer than consumers in other similarly surveyed countries (Piiroinen et al. 2004).

3.3 Research hypotheses for consumer willingness to pay

Based on the theoretical frameworks described above, we may deduce that perfect information on the quality and safety of food products is not available on the food market, and therefore consumer choice is based on quality cues. Information on the quality of food is thus imperfect and may be divided asymmetrically between the various actors in the food chain. It may be imperfect because contamination related to some risk factors may occur along the whole food chain. From these theoretical frameworks, the following hypotheses can be deduced:

Hypothesis I

If there is not enough quality information on the food market, consumers are willing to pay for it and thus indicate gaining utility from increased quality information.

As goods, quality information and food safety are public goods and they cannot be priced using the pricing mechanism in the food chain. This fact validates the choice of the contingent valuation method for the valuation of these market imperfections.

In the food quality policy, one option is to use information guidance or remedy. This method then measures the benefits of this policy change through consumer willingness to pay. Changes in the consumer utility function and the valuation of these changes in welfare theory are discussed in Chapter 4.

Hypothesis II

The higher the risk a consumer associates with food products, the greater is the value increase and willingness to pay for quality information.

In the food market, food safety has become an increasingly significant characteristic after many food crises. The consumer perception of risk affects the search for information on the product. Therefore, risk is one explanatory factor for consumer willingness to pay for quality information.

Hypothesis III

Personal and other people's negative experiences concerning food quality affect willingness to pay for quality information.

Finnish consumers trust in the actors of the food chain. The crucial element is that the quality information is credible and consumers can utilise it in their decision-making process. If there is a lack of reliable information, consumers make decisions based on personal and other people's experiences. In this study, these factors are utilised to explain consumer willingness to pay for quality information.

Hypothesis IV

Trust in the providers of food quality information affects consumer willingness to pay for quality information.

Finnish consumers trust in the actors of the food chain. However, this trust may diminish the willingness to pay for increased quality information. As a consequence, consumers may consider it as their duty to search for additional information, while this should not be left for the consumers to pay.

4 CONSUMER WELFARE CHANGES AND THEIR VALUATION

As stated in Chapter 3, the insufficiency of food quality information forces consumers to base their assessment of the quality of food products merely on various quality cues. Insufficient information on food safety, both asymmetric and incomplete, thereby has an impact on consumer welfare. This chapter presents the theoretical framework derived from welfare economics that was used for the monetary valuation of consumer welfare.

An essential idea in welfare economics is Pareto improvement, or more efficient allocation of societal resources. Chapter 4.1 utilises welfare economics to explore consumer welfare changes and willingness to pay. Because utility cannot be measured using direct, empirical metrics, an alternative way of measuring utility is required. The intensity of consumer preferences between various options can be determined through consumer willingness to pay (Just et al. 1982). At the end of Chapter 4.2, willingness to pay is defined using the concepts of compensating variation and equivalent variation.

4.1 Marshallian demand function and consumer surplus

Assume that the individual demand function is $U = U(x,q)$, where $x = x_1 \ldots x_m$ is the vector for a private good and $q = q_1 \ldots q_n$ is the vector for a public good. This means that individuals can affect the consumed amount of x, whereas q is exogenic, or provided from the outside. For example, in this study, individual beef-buyers are unable to control the quality of particular foodstuffs and the contents of quality information. Further, assume that the price range for x is $p_1 \ldots p_m = p$. Individuals maximise utility in proportion to their income y, whereby the consumer utility maximisation problem can be formulated as follows:

(4.1) $\quad \underset{x}{max}\, u = u(x,q) \quad \sum p_i x_i \leq y$

The solution to the consumer utility maximisation problem is the Marshallian demand function. The demand function expresses the demand x_i for a given good as the function of income y and amount of public good q.

(4.2) $x_i = x_i(p, y, q)$

The demand function allows a comparison of consumer welfare changes using the concept of so-called consumer surplus (Just et al. 1982). In a graphical form, consumer surplus manifests as a triangle bounded by the demand curve, market price and amount of a given good. Consumer surplus occurs when consumer willingness to pay exceeds the market price. Empirical measurement of consumer surplus using a Marshallian demand curve becomes problematic if several price and/or income changes are simultaneously brought under examination (Johansson 1993).

The problems in measuring consumer surplus can be addressed using an indirect utility function. The indirect utility function (V) expresses the maximum individual utility u for prices p and amount of public good q (Haab and McConnell 2002).

(4.3) $V(p, q, y) = \max_x \{ u(x, q) | p \cdot x \le y \}$

Assume that a change occurs in the supply of a public good, while the prices of all other goods and individual income levels are expected to remain unchanged.

(4.4) $\Delta V = V(p, y, q^1) - V(p, y, q^0)$,

where the superscript 0 denotes the original state and 1 denotes the final state for the change occurring for a public good. Assume next that the individual considers the change as an improvement over the present state. However, in some cases the individual may consider the change indifferent, where its value is zero, or the individual may even consider the change as a deterioration of the present situation (negative willingness to pay). For example, in this study, vegetarians may have perceived that increasing the amount and availability of beef quality information is irrelevant from their point of view.

Because utility cannot be measured empirically, monetary valuation of welfare effects caused by changes in public goods must be performed using an inverted expenditure function calculated from the indirect utility function. The expenditure function determines the minimum expenditure required to achieve a given utility function.

(4.5)
$$e(p,q,u) = \min_{x} \{ p \cdot x \mid u(x,q) \geq u \}$$

By differentiating the expenditure function with respect to price, a so-called compensating or Hicksian demand function is obtained:

(4.6)
$$x_i^h(p,q,u) = \frac{\partial e(p,q,u)}{\partial p_i}$$

4.2 The concepts of compensating variation and equivalent variation

In the monetary valuation of welfare effects, the most central concepts are those of compensating variation and equivalent variation, introduced by John R. Hicks[6]. The supply of a public good may either increase or decline; however, this chapter focuses solely on the welfare changes caused by an increase in the supply of a public good.

Compensating variation (CV) is a given quantity of money, where:

(4.7)
$$V(p, y - CV, q^1) = V(p, y, q^0)$$

Thus, compensating variation is the maximal quantity of money that can be taken away from the consumer while allowing the consumer to remain on the same utility level as before the change. In other words, CV denotes consumer willingness to pay for an increased supply of a given good.
Equivalent variation (EV) is the most minimal quantity of money provided to the consumer in order to maintain a level of utility similar to that after an improvement has taken place.

(4.8)
$$V(p, y + EV, q^0) = V(p, y, q^1)$$

The above-mentioned welfare quantities can also be calculated in the case of a private good. In this study, willingness to pay for quality information is determined through changes in prices of a private good, beef. By increasing the price of a private good while assuming no changes in other prices and income levels, it is possible to determine the change in consumer surplus for

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[6] In the 1940s, John R. Hicks (1904-1989) published several articles on consumer surplus in the Review of Economic Studies series.

an increase in the amount of a public good. In the case of an increased public good, this change can be calculated as a compensated variation as follows (Johansson 1993):

(4.9)

$$CV_q = -\int_{p_1^0}^{\infty}\left[x_i(p_i, y - CV(p_i), q_1^1) - x_i(p_i, y - CV(p_i), q_1^0)\right]dp_i$$

The underlying assumption is that except for the private good (x_1) and public good (q_1) under observation, all other prices are excluded from consideration. Households are expected to remain at the original level of utility through compensating variation ($CV(p_1)$). In the formula, the term on the right denotes the original, income-compensated demand function in the original situation, while the term on the left denotes the situation after the change. In Figure 5, the shaded area describes the demand change as the supply of the public good q^1 is increased. In the Figure, the Hicksian demand functions are shown with x_1^c.
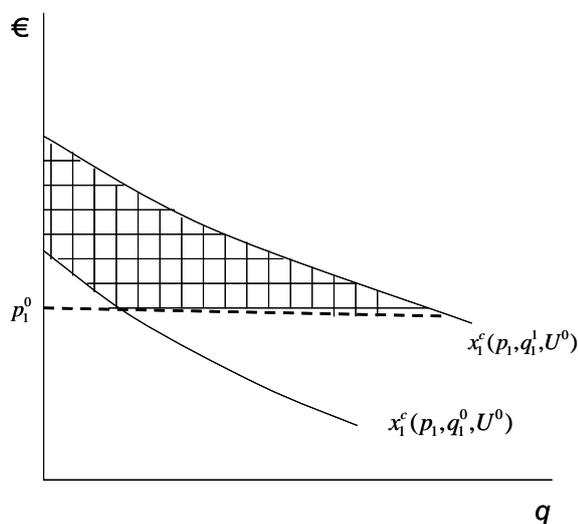
Figure 5. *Monetary change caused by a policy change, in the case of a public good (Johansson 1993).*

Equivalent and compensated welfare changes are often expressed using the concepts of willingness to pay (WTP) or willingness to accept (WTA). Willing-

ness to pay is a meaningful concept in conditions where economic operators wish to acquire more of a particular good. Willingness to accept is an appropriate concept in conditions where economic operators are requested to voluntarily give up a particular good. Rights of ownership determine which concept is the more applicable; if the operator possesses neither the given good nor its rights of ownership, the case at hand is that of willingness to pay (Carson 2000).

The next chapter examines the contingent valuation method used for measuring the welfare changes described above, as well as the operationalisation of consumer willingness to pay.

4.3   The contingent valuation method

Traditionally, economic consumer studies have been based on the exchange of goods on the markets, making observations of consumer buying behaviour through prices and purchase volumes. However, traditional demand analyses cannot measure changes occurring in food safety or information, or their utility effects on the consumers, because these attributes are not directly apparent in food prices. On the markets, food safety generates neither price nor value in its own right. Therefore, the economic value of food safety can be determined through costs of illnesses, pricing differences between products, or consumer willingness to pay studies.

In the cost of illness method, the values to be calculated are *ex post* values. This method calculates the magnitude of costs caused by treatment of illnesses, income losses and production losses. The greatest advantage of the cost of illness method is its ability to draw on relatively readily available statistical data. In addition, sensitivity studies on the changes in the various cost categories can be performed. However, the cost of illness method is considered a rough economic barometer, because it ignores economic values expressed by individuals, such as those concerning their health. Thus, the method does not fit within the concept of utility as defined in economic theory, and it underestimates real social utility (Buzby et al. 1996).

Hedonic price analysis measures utility through the market-based exchange of goods. The hedonic price method is applicable when food products with apparent food safety attributes are sold on the markets. For example, by studying differences in the market prices of conventional and organic food products, it is possible to obtain an estimated price for consumer appreciation of pesticide and herbicide free products. However, safety attributes, especially those of food, cannot often be explicitly determined, and thus no

data are available for the application of this method. The purpose of the hedonic price method is to identify the safety attributes of a given product and set them apart from its other attributes. In the valuation of the various product attributes, especially for novel products, conjoint analysis can also be used (e.g., Baker 1999, Halbrendt et al. 1995). However, the application of price analysis calls for objectively measurable product qualities (Jensen and Basiotis 1993). In terms of food safety, attributes are not directly observable. Research data might consist of studying the preventive measures taken by consumers (e.g., longer cooking times when preparing meals). Obtaining such data requires a survey designed specifically for that purpose.

Another research method that measures consumer utility is the contingent valuation (CV) method. CV is the most frequently used method in food safety studies. As a research method, CV requires a survey where the respondents are queried on the amounts of money they would be willing to pay for the provision of a public good, such as reduced health risks (e.g. Henson 1996): The difficulty with this method lies in the framing of the questions concerning non-priced goods on hypothetical markets.

In recent years, another method besides CV used for studying food attributes has been the choice experiment (CE) method. Choice experiments (CEs) have been employed in the marketing, transportation and psychology literature for some time (Louviere 1988, Hensner 1994). They arose from conjoint analysis which is commonly used in marketing and transportation research. Choice experiments differ from typical conjoint methods in that individuals are asked to choose from alternative bundles of attributes instead of ranking or rating them (Adamowicz et al. 1998).

Adamowicz et al. (1998) also states that the CE method appears to have several advantages relative to the CV method. He argues that CE is based on attributes that allow the researcher to value the attributes as well as situational changes. This method has become increasingly prevalent in studies on food quality and safety during the last couple of years, e.g., Enneking (2004) and Alfnes (2004).

Experimental auctions have also been applied in utility valuations. Compared with the CV method, an experimental auction provides the researcher with much greater control over the experimental conditions, respondents' expenditure and data obtained (Jensen and Basiotis 1993). Concerning food safety, experimental auctions have been used to study subjects such as consumer willingness to pay for food irradiation (Fox et al. 1995, Fox et al. 2002, Shogren et al. 1999) and for hormone-free beef (Alfnes and Rickertsen 2003).

Lee and Hatcher (2000) consider CV as the best method for the cases where the good to be valued is information related to specific attributes of a given good. The CV method provides enough elasticity to analyse specific policies and to measure WTP for an attribute or quality change. Frequently, researchers must fall back on the CV method because the type of data required by other methods is not available. This was the main justification for the factors contributing to the decision to apply the CV method in this case study. In this study, the CE method was considered inapplicable due to insufficient knowledge of the most relevant attributes; it is risky for a researcher to fix the measurements to only a few attributes. This is especially relevant regarding studies where there is no information available from previous research on these attributes and their significance in the consumer choice process. Therefore, CE would be more relevant when a researcher can make use of previous literature on applicable attributes in a straightforward choice situation. The original research plan of the study included the use of experimental auctions. However, due to the reduction of the research grant, this part of the study had to be excluded.

The CV method used to measure consumer willingness to pay has received a great deal of criticism. Specifically, criticism has been levelled at the basic assumption of this method: that the respondents are capable of comparing the various options, and estimating both utility changes and eventual utility in monetary terms. What has been considered particularly problematic is the monetary valuation of nature and living creatures. The method has been further criticised for its so-called hypothetical bias, or the fact that in reality, consumers would not actually be willing to pay the amounts of money they indicated during the study. The solutions to the problems of validity and reliability of the CV method will be discussed in more detail in Chapter 4.4.

In the willingness to pay question of a CV-based study, the first task is to describe to the respondents in the greatest possible detail the good to be valuated and the changes the good is to undergo. The next step consists of the presentation of the actual valuation question. The method incorporates various questioning techniques, including open questions, repeated bids and auctions, payment cards and single-bound or double-bound dichotomic questions. There are also other ways to formulate valuation questions; e.g., Mitchell and Carson (1989) list nine different questioning techniques.

The data elicited by the various questions can be divided into three categories:

(1) continuously variable data, where the respondents name specific amounts of money in response to the question "What is the maximum price you would be willing to pay?"

(2) binary, dichotomic data, where the respondents may respond "Yes" or "No" to the proposed prices, in response to the question "Would you be willing to pay X euros?"

(3) interval data, where willingness to pay is known to fall within a given price range. Interval data can be elicited with varying questioning techniques, such as the presentation of several bids (double-bound dichotomic auction), or all intervals simultaneously (a variant of the payment card technique).

4.3.1 Operationalisation of willingness to pay

This study explores consumer utility in the case of increased information on food quality and safety. Willingness to pay measures this utility in monetary terms. As willingness to pay increases, utility obtained from information can be also assumed to increase. Thus, willingness to pay also reflects the intensity of the utility.

First, the respondents were asked to give their views on the construction of a quality data system; the purpose was to unambiguously identify the provider of information. It has been found that when respondents are able to express their opinions without monetary valuations, the reliability of the willingness to pay question is increased (Blamey et al. 1999). The following general description of the construction of the quality data system was incorporated into the survey:

In Finland, the stakeholders in the food chain (producers, food processing industry, retail sector, consumers and public authorities) have agreed on common goals through which attributes related to the quality and safety of Finnish food can be demonstrated to the consumers. More information on food quality and safety will be communicated to the consumers using a quality information system which is currently under development. Do you believe that such quality information as described above, produced by all stakeholders in the food chain, creates added value for Finnish food (= benefit to consumers)?

Next, the actual scenario on willingness to pay was outlined. The purpose of the scenario was to describe the proposed political action and the consequent changes occurring in the supply of the good to be valuated.

Information on the beef labelling system

The labelling system used in Finland allows beef to be traced back to the farm and animal it came from. The labelling process begins when a calf is born, with the insertion of yellow eartags in both ears. The eartag carries an individual bovine ID that stays with the animal for its whole lifetime. The owner reports the details of an eartagged calf to the bovine register, which is maintained by the public authorities. The sale of an animal from one farm to another is always reported to the register. The last report made by the owner specifies the slaughter-house to which the animal was sent. On one eartag, the animal carries a number that allows the tracing of information on its feeding and possible illnesses and medication. The bovine ID follows the carcass in the slaughterhouse, and all the way to the store.

What does the beef labelling system mean to the consumer? Through the labelling system, the consumers can be given information on the animal from which the beef was produced. Before buying beef, the consumer could also receive information on the feeding and any medication given to the animal, on animal welfare, and on aspects related to the environmental impact of the production process. In terms of food safety, it would mean information on quality control, and on the safety of Finnish beef.

After the scenario, the willingness to pay questions were posed to the respondents. In the typical dichotomic question format, the respondents must make simultaneous decisions on (I) whether they are willing to pay anything at all for the proposed action, and (II) how much would they be willing to pay. In the survey form, this decision-making related problem was addressed by means of a two-staged willingness to pay question: the respondents were first queried whether they had any willingness to pay at all, whereafter the bids were proposed to the respondents who indicated positive willingness to pay.

The respondents who indicated positive willingness to pay by responding "Yes" to the first question were offered bids that were randomly drawn from the range €0.34-2.69 (FIM 2-16[7]). Then, a second willingness to pay

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[7] At the time this study was conducted in 2000, the currency of Finland was the Finnish Mark (FIM, markka). Finland changed over to using euro banknotes and coins on 1 January 2002. The Finnish Mark was used until 28 February 2002. One euro corresponds to 5.94573 Finnish Marks.
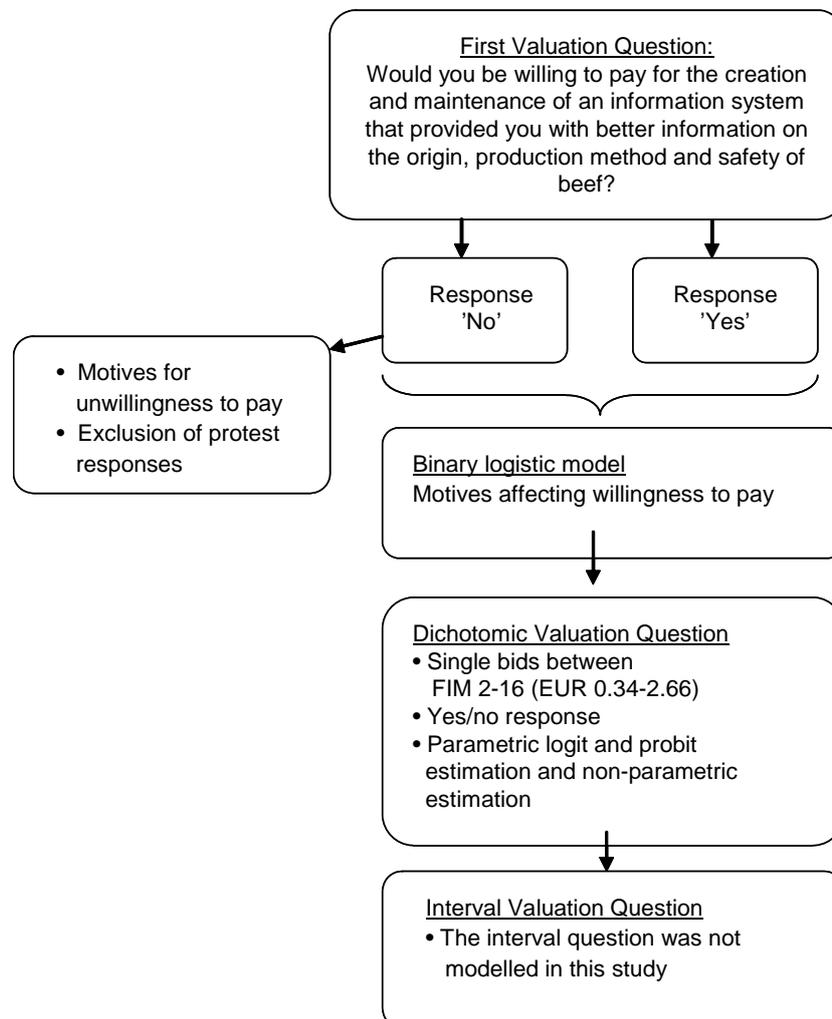
Figure 6. *Willingness to pay questions in this study.*

question was presented with the following willingness to pay intervals: maximum €0.34 per kg; €1.01-1.18 /kg; €1.35-1.68 /kg; €1.85-2.02 /kg; €2.19-2.52 /kg, and over €2.69 /kg.

In addition to the actual willingness to pay question, Arrow et al. (1993) recommended posing the question "Are you willing to pay anything at all?" to the respondents. The aim is to identify the respondents with zero or even negative willingness to pay, as well as the so-called protest responses.

In general, protest responses are linked with the rejection of the scenario, especially if the scenario is not considered credible, or with the

method of payment proposed in the willingness to pay question, such as price or tax increases. In actual terms, protest responses comprise motives that unambiguously reject the valuation scenario, either as unrealistic or poorly defined. Protest responses may also be related to the proposed method of payment, which in this case study was increased food prices. Figure 6 presents the valuation questions posed in this study.

Willingness to pay studies often assume that a good is useful to the consumers (as the very term 'good' implies), whereby an increased supply of the good increases consumer welfare. Kriström (1997) maintains that it is also reasonable to assume that some consumers will receive no additional gain for an increased supply of a non-market good. For example, in this study, vegetarian respondents were not necessarily interested in increased beef product information. Such respondents manifest genuine unwillingness to pay for an increased supply of the good in question.

In addition to the willingness to pay questions, the survey set out to observe issues related to beef buying and consumption, opinions on food-related risks, and personal background data. Views on the safety of beef were asked only after the actual willingness to pay question, to prevent the order of the questions from creating any unintended bias towards exceedingly high willingness to pay by reminding the respondents of risks and hazards. The complete survey form is presented in Appendix 1.

4.3.2 The dichotomic question format

In willingness to pay surveys, the dichotomic question format is the most prevalent, despite an ongoing debate on the selection and applicability of the various questioning techniques (e.g., Arrow et al. 1993, Bateman et al. 2002). As an advantage, this technique provides ease of response by using questions simulating the consumer decision-making process at the moment of purchase, which makes this format applicable in survey-based studies.

As a disadvantage, this technique is considered to elicit only very limited information on the respondents' willingness to pay, whereby certain distribution assumptions must be made for willingness to pay. Proposing varying bids to a given proportion of the respondents also calls for a large original sample.

The single-bound dichotomic question format was first presented by Bishop and Heberlein in their study (1979). A single-bound dichotomic question queries whether the respondents are willing to pay a given amount of money, eliciting either "yes" or "no" answers. Thus, the dependent variable

can receive only two values. Variables with two values are often analysed using so-called qualitative variable analysis methods. The statistical analysis methods for qualitative or categorical variables have particularly been developed in biosciences, in dose-response studies. These studies strive to determine, for instance, the correspondence between given toxin doses and proportional numbers of deaths. The analogy to the CV method is as follows: the higher the "dose" or the proposed bid, the higher the number of "deaths", or "no" responses in terms of willingness to pay (Hanemann and Kanninen 1996).

The dichotomic question format reached the peak of its popularity in the early 1990s, and subsequently experienced a downturn. The main reason for the declining popularity has been the debate on the best ways to ensure incentive compatibility, or framing questions so that the respondents answer the willingness to pay questions as truthfully as possible, according to their preferences (Bateman et al. 2002). In the practical survey situation, it means that it is the respondent's strategic goal to accept the proposed bid, if willingness to pay is greater than or equal to the bid, or to reject the bid in the opposite case.

It is also considered a weakness of this questioning technique that the respondents may very easily respond "yes" ('yea-saying'). Though this phenomenon might occur to some degree, Bateman et al. (2002) consider so-called 'nay-saying' a graver problem. Diametrically opposed to the previous phenomenon, here the respondents either protest to certain characteristics in the scenario, or lack confidence in, for instance, the ability of the public authorities to produce the good at issue.

4.3.3 Interval questions

Although respondents regard the above-described dichotomic question setting as an easy format with questions that are simple to answer, Hanley and Kriström (2002) showed in their study that instead of specific bid sums, the respondents preferred expressing their willingness to pay as intervals. Because a dichotomic question may easily elicit "yes" responses, the reliability of this study was improved by also exploring the consumer willingness to pay by means of willingness to pay intervals. In the actual survey, the interval-based willingness to pay question was implemented as a simplified version of the payment card question, with all intervals available for review to the survey-takers. A total of six intervals were presented to the respondents for consideration.

One of the advantages of the payment card question is that the ability to see several willingness to pay bids makes responding and thus defining a price for willingness to pay easier. At the same time, the so-called anchoring effect is avoided, i.e., responses do not become fixed to any single proposed bid, although the selection of the ending points of the intervals does also influence this questioning format. Another advantage of this questioning technique is that it elicits more information on the distribution than simple Yes/No questions. According to Haab and McConnell (2002), an interval question can be modelled in a similar way to a dichotomic question. An interval question may also be modelled parametrically (Huhtala 2004, Cameron and Hubbert 1989). In this study, the interval question was not modelled.

4.4 Validity and reliability of the chosen method

4.4.1 Validity

Validity can be examined from various perspectives, the most important of which in willingness to pay studies are content and construct validity (Mitchell and Carson 1989). In the context of a willingness to pay study, the theoretical construct to be obtained is the maximal consumer willingness to pay, or the maximum amount of money the consumer would actually pay for the existence of the good to be valuated on the markets (Mitchell and Carson 1989).

Content validity consists of measuring conceptually relevant issues. In willingness to pay studies, particular emphasis falls on the careful construction of the survey form, especially its actual hypothetical scenario and willingness to pay question.

The validity of CV studies has often been challenged, because the different willingness to pay questions (open question versus dichotomic, dichotomic question versus payment card) have elicited varying willingness to pay estimates, although in theory they should all describe the same theoretical construct: Hicksian consumer surplus. All question formats have their weaknesses and strengths, of which the most studied are the effect of the selection of the bids or end points, the so-called anchoring effect, incentive compatibility, and the restrictions imposed by the statistical characteristics of each question format.

Construct validity means the ability of a given measure to generate the results expected from the study, in which case the measure as a whole

works as it is supposed to. In willingness to pay studies, construct validity can be estimated where parallel markets exist, or for example where experimental markets can be created for the goods (Mitchell and Carson 1989). Hanemann (1994) outlines three ways to improve the validity of a study: to repeat the study, to compare the results of the study with other results, and to compare the results of the study to real behaviour whenever possible.

To improve the validity of this study, researchers and experts representing various disciplines and research institutes were asked to review the survey form and provide comments and feedback. The survey form was also pre-tested prior to the actual survey.

4.4.2 Reliability

In a CV study, the attributes of the good to be valuated are described to the respondents using a scenario defined to the highest possible degree of clarity and concreteness, and a sufficient level of credibility. By creating the attributes and credible markets for the good, a situation is constructed where willingness to pay depends on or is, in other words, contingent on the scenario. This is also how the name for the method was derived.

Hanemann (1994) states that reliability can be affected in the following stages: during the formation of the sample and formulation of the survey, in the valuation scenario, the questioning structure, and during the analysis of the research data. The most crucial element in a CV study and its reliability is the formulation of the valuation question. To improve reliability, the valuation scenario must be as realistic and concrete as possible. In this study, the hypothetical bias cannot be considered a major problem, because the good to be valuated (increased quality information) becomes concrete in the context of buying beef, which is a familiar decision-making situation for most respondents.

The actual willingness to pay question should be formulated so that it restricts valuations to a situation that behaviourally resembles voting, where the responses are of the Yes/No type, or so-called closed questions (Arrow et al. 1993, Hanemann 1994). The dichotomic questioning format was chosen because it can be implemented as a computer-aided survey. For example, the NOOA Panel (Arrow et al. 1993) specifically recommended the dichotomic questioning format.

The willingness to pay question is constructed around a specific good, to ensure its maximal relevance and credibility to the respondents. The actual scenario should seem as credible as possible, to encourage the respondents

to express their willingness to pay, even in the absence of actual transactions. The method of payment, e.g., taxes or price increases, must have a credible linkage to the supply of the good in question.

Since the mid-1980s, the most prevalent question format has been the closed question. The deciding argument has been the fact that the closed question format is easier and more familiar to the respondents. In the course of normal commerce, we have to think whether we are willing to buy a given product at a given price. According to Hanemann (1994), people are more willing to tell what a given good costs than what it would be worth to them. The respondents have strategic reasons for quoting prices lower than the full value of the good. The closed question format does not offer strategic reasons for lower price quotes.

CV studies have been criticised for the so-called hypothetical bias, or the fact that in reality the respondents will not pay the quoted prices. The hypothetical bias can be reduced by making the scenario as realistic as possible. In this study, willingness to pay is linked to the buying of a private good, whereby the situation is familiar to the respondents from previous experience.

In this study, the construction of the scenario presented problems with the issue of scope, or changes in the amount of the good to be valuated. In the scenario, the changes could not be explicitly defined, because detailed description and cataloguing of all available quality information would have complicated the actual willingness to pay scenario. Thus, the willingness to pay scenario of this study pointed out to the respondents that it is in fact possible for consumers to receive highly detailed quality information.

In terms of critiquing the questions framed in this study, one might speculate whether the outcome would have been different if the respondents were queried about each quality-related piece of information separately. It was the purpose of this study to determine, through focused questions, what specific quality information the respondents consider relevant to produce, but the willingness to pay for each information requirement was not surveyed. Detailed findings on the requirements for new information in addition to the current package labelling are presented in Chapter 5.6.

5   PRESENTATION AND REVIEW OF RESEARCH DATA

5.1   Research data

The survey form was pre-tested at the S-Market store in Vuosaari, Helsinki, in January 2000. In addition, experts in other research institutes were consulted for improvement suggestions. Based on the responses received during pilot-testing, a bid vector was incorporated into the final form, and the questions exploring consumer willingness to pay were made more specific.

The actual survey was conducted in March 2000, using the Gallup-Kanava (GallupChannel) of Food and Farm Facts Ltd. The GallupKanava is a system created for the collection of data for various surveys and Gallup polls from a permanent group of respondents on a weekly basis. Food and Farm Facts Ltd has furnished 1,300 households with personal computers and Internet access. The respondents had a six-day window for taking the survey, from Thursday to Tuesday, 2-7 March 2000.

The survey population, or the participating households are selected by applying multi-phased stratified sampling. The strata were defined based on the official income distribution statistics for the year 1998, compiled by Statistics Finland. Selection criteria for the sample are household size, as well as the socio-economic status and age of the reference persons. One third of the sample is changed annually.

A comparison of the structure of the sample and the general population data is presented in Table 3. In terms of gender distribution, the structure of the sample corresponds well with that of the general population. In terms of age distribution, the age groups 25-34 years and 35-44 years are proportionally over-represented in the sample, while older age groups are proportionally under-represented. Under 15-year-olds were excluded from this study. In regional terms, Southern Finland has a proportionally higher representation in the sample of the study than in the general population.

Table 3. *Structure of the sample; distribution by sex, age and geographical region*

	General population[1]	Sample of the study
Number	5,171,302	1,640
	%	%
Sex, women	51.2	50.4
Age	%	%
Under 15 yrs	18.2	0.0
15-24 yrs	12.8	13.5
25-34 yrs	12.8	23.2
35-44 yrs	14.8	24.8
45-54 yrs	16.0	19.7
Over 55 yrs	25.3	18.8
Geographical region[2]	%	%
Uusimaa	26.7	29.1
Southern Finland	35.2	42.0
Eastern Finland	13.3	13.7
Central Finland	13.6	13.2
Northern Finland	10.8	2.1
Åland Islands	0.5	0.0

[1] Based on the population statistics at the end of 1999 (Statistics Finland 2000)
[2] Based on NUTS2 (Nomenclature des Unités Territoriales Statistiques), the classification of territorial units defined by Eurostat (The Association of Finnish Local and Regional

5.2 Zero bids and protest responses

In this survey, 8% of the respondents were vegetarian (n = 130) and could therefore be assumed to protest meat-eating in general and the promotion of meat-eating in particular, for ethical reasons. The sample also included respondents who considered building a comprehensive quality information system a worthwhile idea and might even pay more for quality information, but who did not believe that the authorities have the capability to create a sufficiently reliable system. Another factor increasing the respondents' uncertainty is that the various food safety attributes do not necessarily remain unchanged throughout the food chain, as discussed in Chapter 3.1.2 concerning microbiological risks.

The first question on consumer willingness to pay divided the respondents into those willing to pay and those unwilling to pay, thus allowing the respondents willing to pay to be distinctly identified from the others. Based on this first dichotomic question, it was possible to conclude that a relatively

high proportion of the respondents, 42% (n = 696), was not willing to pay for quality information.

Motives underlying this unwillingness to pay were queried in order to make it possible to identify in the sample those respondents who protested the actual valuation question or the scenario. For example, they might protest the payment mechanism or the implementation of change in general. Ethical reasons might also act as motivation for protest responses (Bateman et al. 2002). Table 4 below presents the motives proposed in the survey for unwillingness to pay. The respondents were allowed to select several motives.

The first three motives for unwillingness to pay represent so-called legitimate zero bids, i.e. respondents with no willingness to pay for increased information on food quality and safety. The majority considered that the current labelling system guarantees sufficient food safety and quality. The motive with the second highest response rate was inability to afford more expensive beef. The third most popular reason was lack of trust in package labelling, or that increased package labelling could ensure better quality.

In the survey form, those who selected "another reason" (n = 127) were asked to explain in writing why they were not willing to pay for increased information. Most of the responses to this open question could be interpreted as distinct protest responses. In this study, the respondents who gave even a single protest response (motives 4-6) were excluded from the statistical analysis (Table 4). In consequence, the number of non-respondents decreased to 347, and that of the entire sample to 1,290 respondents. The proportion of those with genuine unwillingness to pay is about 27%.

Table 4. *Motives for unwillingness to pay, and number of protest responses (with respondents allowed to select several motives).*

	Legitimate zero bid (L) or protest response (P)	Number of responses	Proportion of all responses
1. Current labelling provides enough information	L	305	35
2. I cannot afford to buy more expensive food	L	197	22
3. Origin and quality of food are not important to me	L	25	3
4. Food products are always risky, regardless of where they were produced and labelled	P	120	14
5. I do not know exactly what information is available	P	110	12
6. Other reason	P	127	14
Total responses		884	100

5.3　Consumption of beef and buying behaviour

In terms of the consumption of beef, 95% of the respondents stated that they eat food made from beef. About one third of them have a beef-containing meal about once a week (Table 5). A comparison with the study[8] conducted by Henson and Northern (2000) shows that in many European countries (Germany, Ireland, Italy, Spain, Sweden, the United Kingdom), the majority of consumers eat beef once a week. Differences can be seen at the extreme ends of the consumption scale. In Ireland, Spain and Italy, the proportion of those who consume beef several times a week is notably higher than in Finland.

In Finland, 5% of the respondents never eat beef-containing meals. No major shifts towards vegetarianism occurred between 1999 and 2000, as a similar percentage was found in a study conducted about a year earlier using the GallupKanava (Pohjalainen 1999). Henson and Northern (2000) found that the percentage of non-beef-eaters varies considerably between European countries. For example, in Germany and the United Kingdom the proportion exceeds 25%, and also in Ireland and Spain nearly one fifth of the consumers never eat beef. Only in Sweden and Italy does the proportion of non-beef-eaters remain below 10%.

Table 5.　*Consumption of beef; by number of respondents and percentage*

	Number of respondents	%
Daily	23	1
Several times a week	427	26
About once a week	528	32
Twice or three times a month	298	18
About once a month	115	7
Rarely	170	10
Never	79	5
Total	1,640	≈100

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[8] A survey conducted in six European countries (Germany, Ireland, Italy, Spain, Sweden, the United Kingdom) in March 1997. Some 400 consumers were interviewed in each country.

The respondents were also queried about home-made beef-containing meals. Over 30% of the respondents use ground beef 1-2 times a week. In households, the majority of beef-containing meals are made from ground beef. Marinated beef, or beef strips or cubes are used less frequently than other types of beef.

Of the entire sample (n = 1,640), 1,345 respondents buy beef. They were asked where they most often buy their beef, and in what type of packaging. The responses showed that the majority of beef is bought store-packaged. Store-packaged beef is bought more frequently than industrially packaged. In the second place, beef is selected nearly as often industrially packaged as directly from a meat clerk at a meat counter.

According to Järvelä (1998), some consumers were suspicious of both packaged and marinated beef. In this study such suspicion was also evident in the buying behaviour of beef consumers, and 11% of the respondents had occasionally bought beef directly from producers. Consumers often buy beef directly from producers in order to ensure its origin, and there was also dissatisfaction towards the quality and variety of beef sold at stores.

5.4   Consumer opinions of food safety and quality

One of the objectives of this study was to determine which food-related risk factors worry consumers most. The consumers stated that the most harmful food-related risks are food-transmitted zoonotic diseases such as those caused by *Salmonella*, EHEC and campylobacteria. The second most harmful category according to the consumer ratings was environmental pollutants (lead, cadmium), and in third place, drug residues (hormones and antibiotics). Only after these two did the consumers rate pesticide and herbicide residues and genetically modified organisms (Figure 7).

Nutritional aspects such as excessive fat, salt and sugar were not considered overly harmful. In the consumers' perceptions of risks, the ability to affect the degree of risk is a major factor. In general, risks that one can impact to a considerable degree are perceived as inferior to those one cannot impact in any way. In the case of nutritional risk factors, current package labelling provides relevant information on the nutritional contents of food products, e.g., salt and fat contents.
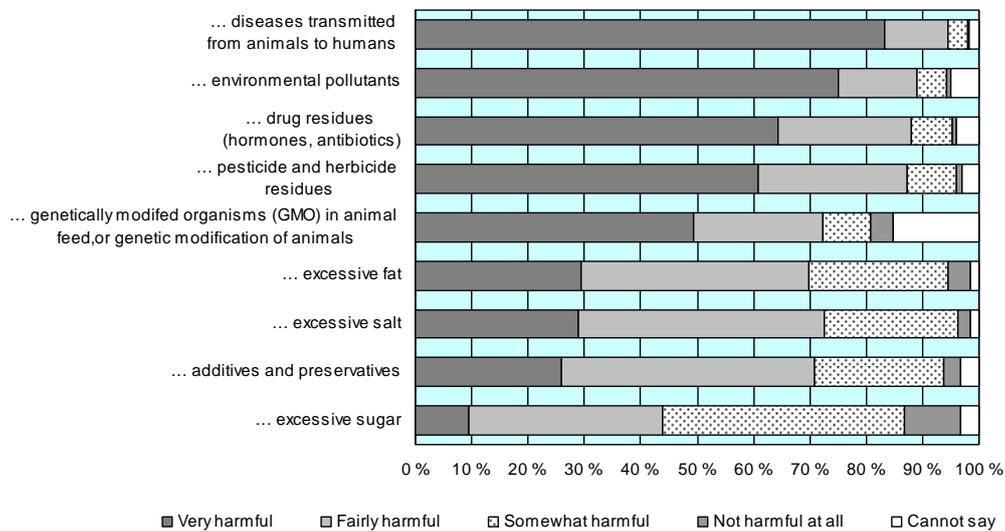
Figure 7. Consumer perceptions of the harmfulness of food products.

5.5 Usage of current beef package labelling

One of the objectives of the survey was to determine how often beef-buying consumers take into consideration observable quality attributes and package labelling. One question set out to determine how often consumers use current package labelling as a decision-making aid. Most often, consumers will check the "use by" date: 73% of the respondents stated that they check the "use by" date every time they buy beef. The second most important piece of information is the production or packaging date. After these aspects, consumers consider the colour of the beef, and the Finnish food label. The price of the beef ranks fifth (Figure 8).

| | 0 % | 10 % | 20 % | 30 % | 40 % | 50 % | 60 % | 70 % | 80 % | 90 % | 100 % |

"Use by" date
Production date or packaging date
Finnish beef -marking
Colour of the beef
Price
Finnish food label
Producer's quality label
Fat content
Producer's quality label
Organic food label

■ every time   ■ almost every time   ▨ about every second time   ▨ occasionally   □ never
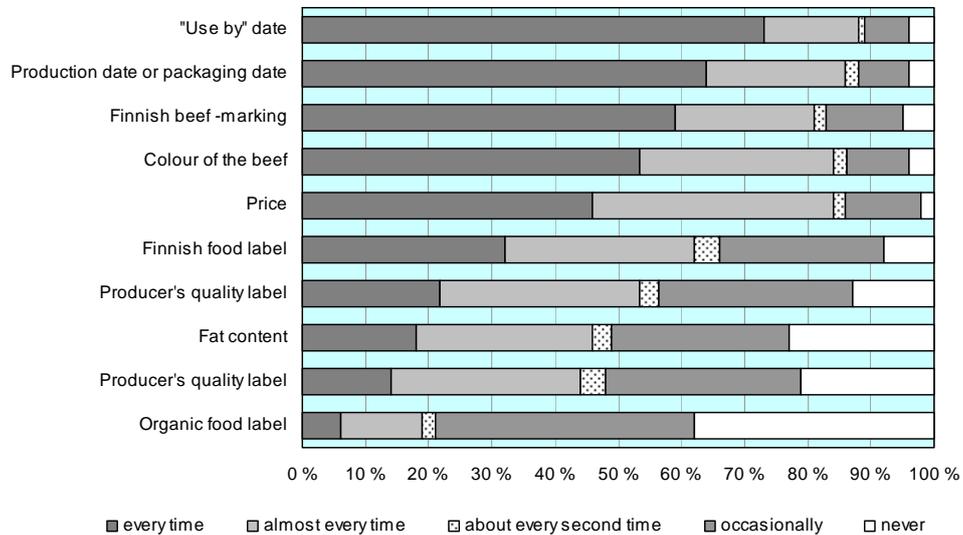
Figure 8. *Usage of current beef package labelling.*

The quality labels of private food businesses were not considered very important as selection criteria. In this context, it must be noted that the availability and informational contents of private-enterprise quality labels are still under development. This applies especially well to the organic food label: currently, the availability of organic beef is limited; thus, the question may have made the respondents refer to organic food products in general.

5.6   Requirements for new information

In addition to the willingness to pay, consumers' informational requirements were explored in detail. The responses show that in the first place, consumers would like to receive information on the control of zoonotic diseases that are contagious to humans. This is consistent with the fact that consumers considered food-transmitted zoonotic diseases as the highest risk factor in food. Similarly, other process control related information (e.g., information on the use of drugs and on the monitoring of heavy metals and slaughterhouses) ranked high among the top responses. Information on any potential genetic modification (modification of animal genes, and use of genetically modified animal feed) was also considered important, even though genetic modification was not regarded as a high risk factor (Figure 7, Chapter 5.4.).

Based on the responses, it can be concluded that safety-related quality cues are important to consumers.

The second most important aspect to the respondents was traceability. Of all information on the origin of food, the respondents gave the highest priority to the country of origin, while region, farm or animal-specific information was not considered very important at all. In terms of informational requirements concerning production processes, aspects related to animal welfare, the use of pesticides and herbicides, and the safety of feed gained the most prominence. Table 6 lists the surveyed details according to the averages calculated from the responses. The table also specifies whether the attribute in question is related to safety (S), origin (O), or the production process (P). Based on the responses, attributes related to safety and origin are the most important sources of informational requirements.

Table 6. *Consumer requirements for additional information, by response average.*

Average: 1 = not important at all, and 5 = very important Attribute: S = Safety, O = Origin, P = Production process	Average	Attribute
1. Control at farms of diseases transmitted from animals to humans	4.4	S
2. Has the production animal been subject to genetic modification	4.3	S
3. Country of origin	4.3	O
4. Has the production animal been given any hormones	4.3	S
5. How often beef is inspected for EHEC and Salmonella bacteria	4.3	S
6. How is the use of antibiotics and other veterinary drugs controlled	4.2	S
7. Have animal feeds been subject to genetic modification	4.1	S
8. Inspections of slaughterhouses and their results	4.0	S
9. How often beef is inspected for heavy metals and pesticide and herbicide residues	4.0	S
10. Control of animal welfare and conditions	3.9	P
11. When was the production animal slaughtered and how long did it take for the beef to reach the consumers	3.8	S
12. Medication given to the production animal	3.8	S
13. Is attention paid to the reduced use of pesticides and herbicides	3.8	P
14. Feeds used on farms	3.8	P
15. Do animals have free-range, outdoor access	3.7	P
16. Duration of animal transportation	3.6	P
17. Is nutrient washout taken into consideration in beef production	3.3	P
18. Production animal from which beef comes	2.9	O
19. Price paid to producer	2.9	P
20. Prices paid to other stakeholders in the food chain (food industry, retail sector)	2.8	P
21. Does the production farm have an agricultural quality control system	2.8	P
22. Age of production animal	2.7	O
23. Region of origin	2.6	O
24. Breed of production animal	2.2	O
25. Production farm	2.2	O
26. Sex of production animal	2.1	O

In addition to these responses, the respondents could answer an open question in case they had requirements for information which the survey form failed to specify. The open questions elicited some comments on organic food and animal welfare (n = 18). The survey form contained two questions that referred to animal welfare, but the subject was not directly linked to the concept of organic food.

Some responses contained comments on the excessive supply of information, or on reliability of information. This question elicited 13 distinct protest responses, most of them associated with the comments given by vegetarians. In addition to the details listed in Table 6, the respondents did not express any specific further informational requirements.

5.7   Trust in providers of information

According to Mitchell and Carson (1995), it is important for a valuation scenario to specify the producer of a non-market good. In the survey, the provider of information was specified as "the whole food chain together". Consumer trust in these sources of information was explored with three-dimensional questions: who is the fastest producer of information, who produces the most reliable information, and who produces the largest amount of information?

When queried about the most reliable producer of information on the safety and quality of food, the respondents were divided into two categories of near-equal size. Altogether, 40% of the respondents stated that the most reliable source of information would be the Finnish authorities responsible for food safety control. Food safety information generated by the entire food chain together (producers, the food industry, the retail sector, consumers, agricultural expert organisations, research organisations and public authorities) was regarded as almost equally reliable (38% of the respondents).

Private research laboratories, the food industry and European Union food safety authorities were considered as less reliable sources of information. Based on the responses, it can be concluded that the majority of the respondents (78%) trust in the Finnish food safety authorities, as well as the co-operation of all stakeholders in the food chain.

6   WILLINGNESS TO PAY

6.1   Modelling willingness to pay

Willingness to pay can be analysed in several ways. Chapter 6.1.1 explores the motives for willingness to pay using a binary logistic model. Parametric modelling of willingness to pay is discussed in Chapter 6.1.2, based on random utility and random willingness to pay models. Chapters 6.1.3 and 6.1.4 study willingness to pay through non-parametric modelling.

6.1.1   Binary logistic model

The factors affecting consumer willingness to pay were examined using a binary logistic model. The dependent variable of the model divided the respondents into two categories: those willing to pay and those unwilling to pay. The purpose of the model was to identify the most important explanatory factors for willingness to pay. In the analysis, willingness to pay acted as a dichotomic dependent variable that received the value 1 for respondents indicating willingness to pay > 0, and, respectively, the value 0 for respondents indicating no willingness to pay.

The method calculates the probability (y = 1) of an outcome, as derived from the following formula:

$$(6.1) \quad P(y=1) = \frac{e^z}{1+e^z} = \frac{1}{1+e^{-z}}$$

where z is a linear function of the explanatory parameters.

The purpose of a logit analysis is to explain willingness to pay on the basis of a theoretical framework. Motives explaining willingness to pay can be defined as follows, on the basis of the theoretical framework underlying this and earlier studies:

–   awareness of risks (Latouche et al. 1998);
–   personal negative experience of illness caused by inferior food (Bettman 1979, Järvelä 1998);
–   other people's negative experiences of illness caused by inferior food (Bettman 1979, Järvelä 1998);

- food-related risk factors and their harmfulness (risks specific to given product categories; Dowling and Staelin 1994);
- knowledge of the product (McCarthy and Henson 2005);
- trust in the providers of information (McCarthy and Henson 2005, Piironen et al. 2004)
- trust in storekeepers (McCarthy and Henson 2005, Piiroinen 2004);
- sociodemographic characteristics (sex, age, gross and net income of the household, region of residence, political party, number of children, special diet, vocational training, basic education, type of residential area);
- usage of current package labelling (only beef-buying respondents queried, n = 1036);
- knowledge of primary production in general.

Appendix 1 contains a detailed list of the classification and coding of the explanatory variables.

6.1.2   Random utility and random willingness to pay models

For the econometric modelling of a dichotomic willingness to pay question, there are two approaches: estimating willingness to pay on the basis of utility theory or, directly, using the distribution of willingness to pay (Bateman et al. 2002, Haab and McConnell 2002, Hanemann and Kanninen 1996). Bishop and Heberlein (1979) were the first to employ the dichotomic willingness to pay question, from which Hanemann (1984) later formed the first statistical model based on the utility theory. Hanemann's (1984) willingness to pay model was founded on McFadden's (1974) concept of *random utility*. Hanemann's (1984) *random utility model* (RUM) allows the essential parameters used in willingness to pay studies to be estimated and interpreted according to economic theory (Haab and McConnell 2002).

The model assumes that in terms of willingness to pay, the respondent is comparing the respective utility arising from two different situations:

(6.2) $u_{ij} = u_i(y_j, z_j, \varepsilon_{ij})$

where $i = 1$ describes the situation after the occurrence of the scenario and $i = 0$ describes the current situation.

In the formula, the variables explaining the utility are y_j, or the discretionary income of the respondent j; and z_j, describing household characteristics and attributes explaining selection, as well as an error term, ε_{ij}. While

factors contributing to individual decision-making are partly unknown to the researcher, a random error term, ε (McFadden 1974) is incorporated into the model. Factors unknown to the researcher may be associated either with personal characteristics, or the characteristics of the good to be valuated; they may arise from differences between individual preferences, as well as measurement error (Hanemann 1984, Hanemann and Kanninen 1996).

The model assumes that the respondent compares the original situation q^0 to the change q^1 presented in the scenario. Thus, in this study, it is assumed that the respondents compared the improved availability of quality information to the situation prevalent at the time of the survey. In the original context, utility is thus described as follows:

(6.3) $u_{oj} = u(y_j, z_j, q^0, \varepsilon_{0j})$

and, respectively, after the change:

(6.4) $u_{1j} = u(y_j, z_j, q^1, \varepsilon_{1j})$

A dichotomic question assumes that the respondent j responds "yes" to the proposed sum t_j, if the utility from the policy change is greater in the new situation and there is willingness to pay the proposed sum.

Because some of the respondents' preferences were unknown, "yes" and "no" responses could be determined using probabilities, and the error term ε_{ij}, was incorporated into the model. The probability of the respondent's "yes" response to the policy change $q^0 \rightarrow q^1$ is described with the following formula:

(6.5) $\Pr(yes_j) = \Pr(u_1(y_j - t_j, z_j, \varepsilon_{1j}) > u_0(y_j, z_j, \varepsilon_{0j})$

The parametric estimation requires two decisions related to the modelling. The first decision concerns the functional form of the utility function $u(y_j, z_j, \varepsilon_{ij})$, and the second, the distribution of the error term ε_{ij} (Haab and McConnell 2002). The utility function is divided into deterministic and stochastic preferences by using the indirect utility function $v_i(y_j, z_j)$ and error term ε_{ij}, as follows:

(6.6) $u_i(y_j, z_j, \varepsilon_{ij}) = v_i(y_j, z_j) + \varepsilon_{ij}$

Thus, the probability of the "yes" response of the respondent j is as follows:

(6.7) $\Pr(yes_j) = \Pr[(v_1(y_j - t_j, z_j) + \varepsilon_{1j} > v_0(y_j, z_j) + \varepsilon_{0j}]$

The indirect utility function can be determined by using several different distributions, and economic theory does not point to any specific distribution (Hanemann and Kanninen 1996). Usually, the dichotomic question format presumes positive willingness to pay from all respondents. Common distribution assumptions for the utility function are the log-logistic distribution, log-normal distribution, or Weinbull distribution. Other frequently used distributions include the Box-Cox utility function, with its logit and probit versions (Hanemann and Kanninen 1996).

For the indirect utility function based estimation approach described above, there is an alternative estimation method, based on the bid function approach, also known as the *random willingness to pay model* (random WTP). Because willingness to pay is regarded as a sufficiently determined concept in itself, it can be used without explicitly determining the format of the underlying utility function (Cameron 1988). Cameron's (1988) model directly specifies a given cumulative frequency function (cdf) $G_C(\cdot)$ for individual willingness to pay, $C(q^0, q^1, y, p, s, \varepsilon)$. The error term ε continues to describe the variation that the researcher cannot observe. Thus:

(6.8) $\Pr\{yes\} = 1 - G_c(\cdot)$

If cdf is assumed to follow a normal distribution $G(x) = \Phi(x)$, a probit model is obtained.

(6.9) $\Pr\{yes\} = \Phi\left(\dfrac{\mu - t}{\sigma}\right)$

$where\ E\{C\} = \mu$

Respectively, if cdf is assumed to follow a logistic distribution $G(x) = (1+e^{-x})^{-1}$, a logit model is obtained.

(6.10) $\Pr\{yes\} = \dfrac{1}{1 + (\exp[(t - \mu)/\theta]}$

$where\ \theta \equiv \sigma \sqrt{3}/\pi$

Several other alternatives exist, such as the Box-Cox transformation used by Cameron and James (1987). According to Bateman et al. (2002), the litera-

ture on willingness to pay does not present a clear consensus on which approach, RUM or random WTP, is the more appropriate. If one wishes to remain loyal to the fundamental concepts of the Neoclassical economic theory, one chooses RUM. Bateman et al. (2002) stated that RUM determines the impact of income on the utility. The random WTP model determines the impact of income on willingness to pay.

6.1.3 The Turnbull estimator

In willingness to pay studies, the respondents' willingness to pay can also be estimated non-parametrically, without assuming a utility function or distribution of an error term. In such cases, willingness to pay is estimated by using bid vectors, and point estimations of the willingness to pay probabilities. According to economic theory, as the bid sum increases, the locations of these points render the willingness to pay function genuinely monotonic at each point. However, in reality this fails to occur, for reasons such as randomness, and thus it is possible to set a strict monotonicity restriction for the estimation (Turnbull 1976, Ayer et al. 1955). In willingness to pay studies, the Turnbull estimator has been employed, for example, by Hanemann et al. (1994) and Haab and McConnell (1997).

In the non-parametric estimation of a dichotomic willingness to pay question, the relative proportions of "no" responses are calculated for each bid, a point estimation for the willingness to pay function is made for each bid t_i, and the relative proportion of "no" responses F_j is calculated as follows:

$$(6.11) \quad F_j = \frac{N_j}{T_j} \quad j = 0 \rightarrow J$$

where N_j is the proportion of "no" responses of the combined total T_j of all "yes" and "no" responses.

Although, when calculated using relative proportions, the original function F_j is not monotonic at every point, the proportions enable the calculation of new point estimations by means of the *Turnbull distribution-free estimator* (Turnbull 1976, Haab and McConnell 2002). A monotonicity restriction of $F_j \leq F_{j+1}$ is set for the function, with all values of j (Haab and McConnell 2002).

If the consecutive relative proportions $F_{j+1} > F_j$ are pooled, F_{j+1} and F_j and a new probability value $(N_j + N_{j+1})/(F_j + F_{j+1})$ are calculated. These substitutions are made until the function becomes monotonic.

Willingness to pay is calculated from a monotonic willingness to pay curve by dividing willingness to pay into subranges $\{0\text{-}t_1, t_1\text{-}t_2, …, t_{M*}\text{-}U\}$ (Turnbull 1976, Haab and McConnell 2002). To calculate the lower bound (LB) of willingness to pay, WTP_{LB} (where LB indicates that the accumulation of the probability mass is calculated only at the lower end bound of the subrange), $F(0) = 0$ and the upper bound $Fw(U)$ for willingness to pay must also be determined. By using these subranges, willingness to pay can be calculated with the following formula:

$$(6.12) \quad E_{LB}(WTP) = \sum_{j=0}^{M*} t_j \cdot f_{j+1}^*$$

The variance for the willingness to pay estimation is obtained as follows:

$$(6.13) \quad V(E_{LB}(WTP)) = \sum_{j=1}^{M*} \frac{F_j^*(1-F_j^*)}{T_j^*}\left(t_j - t_{j-1}\right)^2 = \sum_{j=1}^{M*} V(F_j^*\left(t_j - t_{j-1}\right)^2$$

The model described above can be applied to the modelling of a dichotomic willingness to pay question. The next chapter explores other alternatives for the non-parametric modelling of a dichotomic question.

6.1.4 The Kriström distribution-free willingness to pay estimation

In his article, Kriström (1990) utilised the Ayer et al. (1955) estimator in a nearly identical fashion. In Kriström's (1990) model, willingness to pay is calculated geometrically from an area bounded by a survivor function and the x and y axes, by calculating the so-called survivor function $1-F_j^*$ between observed bid estimates. Between the point estimations, Kriström (1990) uses linear interpolation, whereby the survivor function is bounded by the x axis.

The area formed by two contiguous bids t_j and t_{j+1} is calculated as follows (Haab and McConnell 2002):

$$(6.14) \quad \int_{t_j}^{t_{j+1}} (1 - F_W(w)) dw = (1 - F_{j+1}^*)(t_{j+1} - t_j) + \frac{[F_{j+1}^* - F_j^*]}{2}(t_{j+1} - t_j)$$

$$= (t_{j+1} - t_j)\left(1 - \frac{[F_{j+1}^* - F_j^*]}{2}\right)$$

In the model, willingness to pay is obtained as follows:

$$(6.15)$$

$$E(WTP) = \sum_{j=0}^{M} \int_{j=0}^{t_{j+1}} [1 - F_W(w)] dw = \sum_{j=0}^{M} (t_{j+1} - t_j)\left(1 - \frac{(F_j^* + F_{j+1}^*)}{2}\right)$$

To calculate the willingness to pay, $t_o = 0$ and the upper limit of willingness to pay t_{M+1} must be determined.

In this study, the research data only included the respondents who exhibited positive willingness to pay, whereby the survivor function $1 - F_j^*$ receives the value one with the bid zero. On the other hand, t_{M+1} must be determined through linear interpolation.

6.2   Results of the willingness to pay models

This study employed contingent valuation to estimate consumer willingness to pay for an increased amount of information on the safety and quality of beef. Logit analysis was used to identify the factors influencing the expressed willingness to pay, including sociodemographic factors, personal experiences of beef, perceived food risks and trust in the providers of information. In this chapter, willingness to pay is calculated using parametric and non-parametric methods.

6.2.1   Binomial logit model and factors explaining willingness to pay

The factors affecting consumer willingness to pay were examined using a binomial logit model. The dependent variable of the model divided the respondents into two categories: those willing to pay and those unwilling to

pay. In the survey, a total of 1,290 respondents (protest answers excluded) answered the first dichotomic willingness to pay question. Of this total, 944 respondents (73%) indicated willingness to pay, while 346 (nearly 27% of all respondents) gave a negative response.

The purpose of the model was to identify factors distinguishing the two categories of consumers. In the analysis, willingness to pay acted as a dichotomic dependent variable that received a value 1 for respondents indicating willingness to pay > 0, and, respectively, a value of 0 for respondents indicating no willingness to pay. Appendix 1 presents a detailed classification of the explanatory variables.

The goodness of fit of the model to the research data was evaluated using the -2 Log Likelihood (1,327.671) and its explanatory power using the Cox-Snell R-square (0.126) and the Nagelkerke R-square (0.183). However, the interpretation of the Cox-Snell R-square value is not the same as in an ordinary linear regression analysis, because it cannot receive the value 1. However, the latter or Nagelkerke R-square value can be interpreted similarly to that of linear regression analysis. In this case, the variables of the model only explained some 18.3% of the variance of the dependent variable.

Although the model did not appear particularly well-fitting when evaluated using the $-2LL$ and R-square values, it nevertheless succeeded in predicting nearly 80% of the observations into the correct category (Table 7). At the estimation stage, the model performed quite robustly, i.e. during the statistical analysis of the explanatory variables, the removal or insertion of variables kept the R-square values, preceding signs and mean errors of the model quite stable.

Table 7.   *Observed and predicted values produced by the binomial logit model.*

Observed values	Predicted values		
	No willingness to pay	Positive willingness to pay	Correctly predicted (%)
No willingness to pay	83	263	24.1
Positive willingness to pay	42	902	95.5
Total percentage			76.4

Only the statistically most significant coefficients were selected for inclusion in the model, as presented in Table 8 below. The results of the model showed that the factors with a positive effect on willingness to pay included several trust-related variables: for example, consumer trust in a particular provider of information increased positive willingness to pay. Factors decreasing willingness to pay, or coefficients with negative preceding signs, were observed in the cases where the respondents rarely ate beef.

Based on the theoretical framework of this study, one might have assumed that negative personal experiences would emerge as a significant explanatory factor for willingness to pay, but in the research data this was not the case. Instead, it was the variable representing other people's negative experiences of food that was found significant in the model. This is a rather

Table 8. *Binomial logit model (n = 1,290).*

Variable	β	S.E	Sig.	Odds ratio
Buys beef (β1)	0.533	0.184	0.004	1.704
Knows or has heard of people who have fallen sick from inferior food (β2)	0.317	0.139	0.022	1.373
Considers genetic modification of food harmful (β3)	0.520	0.143	0.000	1.682
Rarely eats beef (β4)	-0.490	0.171	0,004	0.613
Has trust in storekeepers (β5)	0.303	0.139	0.029	1.354
Has trust in the information provided by the Finnish authorities (β6)	1.643	0.261	0.000	5.171
Has trust in the information provided by the whole food chain together (β7)	1.554	0.236	0.000	4.728
Has trust in the information provided by private research laboratories (β8)	1.635	0.381	0.000	5.131
Has trust in the information provided by consumer organisations (β9)	0.895	0.333	0.007	2.447
Has trust in the information provided by the food industry (β10)	1.451	0.645	0.025	4.266
Has trust in the information provided by the European Union authorities (β11)	1.283	0.415	0.002	3.609
Has responsibility for grocery shopping, alone or together with someone else (β12)	0.485	0.161	0.003	1.624
Considers foodborne zoonotic diseases harmful (β13)	0.383	0.183	0.036	1.467
Constant (α)	-1.912	0.317	0.000	0.148

interesting result, because some 17% of the respondents reported personal experience of illness caused by inferior food, while 50% knew or had heard of other people with similar negative experiences.

Of the variables describing the categorical risks of food, two were selected for inclusion in the model: genetic modification of food and foodborne zoonotic diseases, where they were considered as harmful risks. Quite distinctly, the most significant variables affecting consumer willingness to pay were trust in the providers of information, as well as trust in the capability of storekeepers to ensure that the beef sold in stores is safe. Trust in the operators of the food chain was also significant for willingness to pay.

Of the factors describing consumer buying behaviour, two were selected for inclusion in the model: the respondents who do buy beef in the first place, and the respondents with grocery shopping responsibility in the family.

Numerous other variables were also tested for inclusion in the model, but they did not prove significant (Appendix 1). For example, several typical sociodemographic factors describing the respondents, such as age, sex, occupation, gross income and net income, were not significant for willingness to pay in this model. This is a typical phenomenon in studies focused on consumer choice (Enneking 2004).

The predicted probability for willingness to pay can be calculated as follows:

$$(6.16) \quad P(y=1) = \frac{e^z}{1+e^z} = \frac{1}{1+e^{-z}}$$

where

$z = -1.912 + 0.533 * \beta_1 + 0.317 * \beta_2 + 0.520 * \beta_3 - 0.490 * \beta_4 + 0.303 * \beta_5 + 1.643 * \beta_6 + 1.554 * \beta_7 + 1.635 * \beta_8 + 0.895 * \beta_9 + 1.451* \beta_{10} + 1.283 * \beta_{11} + 0.485 * \beta_{12} + 0.383 * \beta_{13}$

In Table 8 above, the odds ratio calculated for each variable describes the degree to which the variables affect the probability. Below, two sample respondent profiles demonstrate the effect of the coefficients on the probability of the willingness to pay or unwillingness to pay. If the predicted probability receives a value < 0.5, the respondent is not willing to pay. If the probability value is greater than or equal to 0.5, the respondent belongs in the category of those willing to pay.

Sample profile, Respondent 1:

Respondent 1 does not buy beef ((β_1 = 0, β_{12} = 0) and rarely eats beef (β_4 = 1). In addition, Respondent 1 considers neither genetic modification of food nor foodborne zoonotic diseases as harmful food-related risks (β_3 = 0 and β_{13} = 0), and all trust-related variables (β_5 – β_{11}) receive the value 0 (no trust in storekeepers or quality information from any source). This probability receives the value 0.083. A probability value of 0.083 indicates that the respondent is not willing to pay for increased beef quality information.

Sample profile, Respondent 2:

Respondent 2 buys beef (β_1 = 1) and considers genetic modification of food and foodborne zoonotic diseases as harmful food-related risks (β_3 and β_{13} = 1). Respondent 2 also trusts in the information provided by the Finnish authorities (β_6 = 1). This probability receives the value 0.810. A probability value greater than or equal to 0.5 indicates that the respondent is willing to pay for increased beef quality information.

Limiting the model to beef-buyers and primary grocery shoppers

The next step was to limit the model to apply only to the respondents with the primary responsibility for grocery shopping in the household, and to those who buy beef in the first place (n = 889). The purpose was to determine whether the explanatory variables occurring in this group were different in comparison to the total sample. Usage of the current package labelling could also be studied in this group, because all respondents bought beef at least occasionally.

In this model, the –2 Log Likelihood received the value 876.831, and the explanatory power remained noticeably lower than in the previous model: the Cox-Snell R-square received the value 0.072 and Nagelkerke R-Square 0.115. Despite the lower explanatory power, the model succeeded in predicting 80.5% of the observations into the correct category (Table 9).

The two trust-related variables, trust in the storekeepers and trust in the various providers of information (public authorities, the whole food chain together, private laboratories) were retained in the model. On the other hand, genetic modification of food was now excluded from the variables describing food-related harmful risks, and only a single variable remained to represent this category: foodborne zoonotic diseases.

Knowledge of other people's negative experiences of food also remained a variable explaining willingness to pay in this group of respondents. Because every member of this group bought beef, the model was able to test

the usage of the current package labelling. Of the current markings, the respondents check the "use by" date, the Finnish beef label, and the organic food label.

Table 9. Willingness to buy of the respondents with primary responsibility for grocery shopping

Variable	β	S.E	Sig.	Odds
Has trust in storekeepers (β1)	0.457	0.182	0.009	1.607
Considers foodborne zoonotic diseases harmful (β2)	0.491	0.241	0.042	1.634
Knows or has heard of people who have fallen sick from inferior food (β3)	0.357	0.183	0.051	1.428
Has trust in the information provided by the Finnish authorities (β4)	0.962	0.240	0.000	2.616
Has trust in the information provided by the whole food chain (β5)	0.935	0.242	0,000	2.546
Has trust in the information provided by private research laboratories (β6)	1.648	0.556	0.003	5.199
Checks the "use by" date in the current package labelling (β6)	0.551	0.274	0.044	1.734
Checks the Finnish beef marking in the current package labelling (β6)	0.610	0.234	0.009	1.840
Checks the organic food label in the current package labelling (β6)	0.663	0.238	0.005	1.940
Constant (α)	-1.391	0.404	0.000	0.249

6.2.2 Parametric estimation of willingness to pay

The respondents who gave a positive response to the first willingness to pay question were next posed a dichotomic willingness to pay question proposing a single bid sum. Protest responses were excluded from the statistical analysis.

In the model, the dependent variable still received the value 1 for willingness to pay, and 0 for no willingness to pay. The explanatory variables were the proposed bid, as well as the respondents' net income and sex (1 = female, 2 = male) (Table 10).

Table 10. *Description of the variables and average values of the dichoto-mic model.*

Variable	Description	Average (n = 813)
Bid sum	Price increase for beef, €/kg	1.43
t109	Available income, €	2,048
t1	Sex of the respondent (percentage of women)	50

Table 11 *presents the parameter values obtained from the logit and probit estimations of the linear random utility function.*

Table 11. *Results of the dichotomic logit and probit models.*

Pr(θ < (αo + α1 t1 + α2 t109- β bid)/σ))		
	θ logistic Parameter value (mean distribution)	θ normal Parameter value (mean distribution)
β/σ	-0.192 *** (0.0232)	-1.118 (0.0137)
αo /σ	2.884 *** (0.389)	1.752 (0.227)
α1/σ	-0.427 ** (0.187)	-0.255 (0.112)
α2/σ	-0.000 (0.000)	-0.000 (0.000)
Log-Likelihood	-337.740	-337.306
Chi-Squared	83.855	84.722

Thus, willingness to pay is the amount of money at which the respondent feels indifference between the present situation (status quo) and the sce-nario proposed in the model. In the linear random utility model, willingness to pay (WTP) can thus be expressed as follows (Haab and McConnell 2002):

(6.17) $\quad \alpha_1 z_j + \beta(y_i - WTP_j) + \varepsilon_{ji} = \alpha_0 z_j + \beta y_i + \varepsilon_{j0}$

From this, willingness to pay is calculated using the following formula:

(6.18) $WTP_j = \alpha z_j / \beta + \varepsilon_j / \beta$

The logit model produces the sum of €1.97/kg as the mean willingness to pay value, while the respective result of the probit model is only €0.21/kg. In the probit model, the coefficients were not statistically significant. In terms of these research data, the results clearly showed that the selection of the form of the function has a great impact on the final results.

6.2.3   Non-parametric estimation of willingness to pay

The non-parametric estimation of willingness to pay using the Turnbull esti-mator is presented in Table 12. In this willingness to pay study, non-monotonicity was caused, for example, by the fact that the respondents were proposed too many bids with intervals that were too short. In addition, responses always contain a certain degree of randomness and, as a conse-quence, the original function is not genuinely monotonic (Figure 9). In Table 12, the data have been pooled into a genuinely monotonic function.
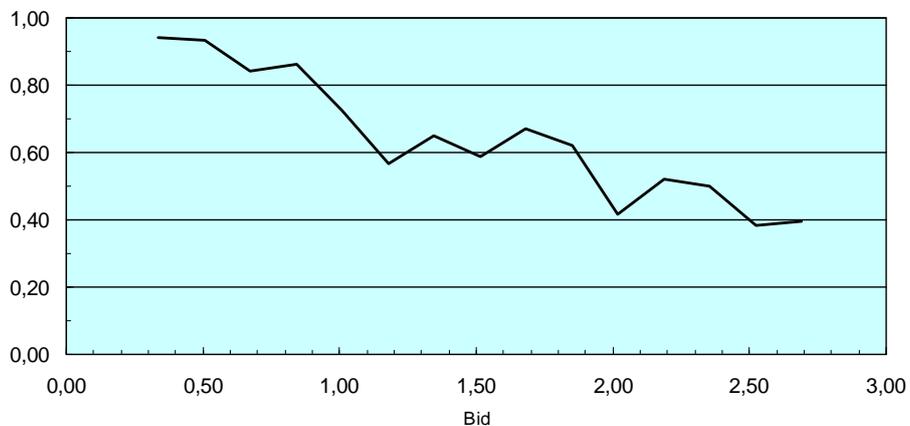
Figure 9.   *Original point estimations for the willingness to pay probabilities.*

Table 12. *Results of the Turnbull estimator.*

Bid (tj), euros (€)	Number of "No" responses (Nj)	Unlimited			Turnbull * denotes observations pooled with the previous observation	
		Number of bids (Tj)	$F_j = \dfrac{N_j}{T_j}$	F_j*	f_j*	
0.34	3	52	0.058	0.058	0.058
0.50	3	46	0.065	0.065	0.008
0.67	9	57	0.158	0.148	0.083
0.84	7	51	0.137	*	*
1.01	13	47	0.277	0.277	0.128
1.18	29	67	0.433	0.395	0.119
1.35	20	57	0.351	*	*
1.51	23	56	0.411	0.396	0.001
1.68	18	55	0.327	*	*
1.85	19	50	0.380	*	*
2.02	32	55	0.582	0.543	0.147
2.19	25	52	0.481	*	*
2.35	25	50	0.500	*	*
2.52	37	60	0.617	0.610	0.067
2.69	35	58	0.603	*	*
> 2.69	-	-	-	1	0.390

In the Turnbull estimator, willingness to pay is calculated using the formula (6.19), and the results are presented in Table 13:

(6.19)
$$E_{LB}(WTP) = \sum_{j=0}^{M+} t_j\, f^*_{j+1}$$

Table 13.   *Willingness to pay using the Turnbull estimator.*

Average willingness to pay, €	1.59
Variance	0.005
Mean error	0.094
95% confidence interval WTP +/- 1.96 * mean error	1.409
	1.777

The Kriström non-parametric estimation

Kriström draws on the approach developed by Ayer et al. (1955). The difference from the above-described Turnbull estimator is that this model uses linear interpolation to increase the mass of probability, allowing the end points of the scale to be fixed to the axes (Figure 10).

Using this method, a willingness to pay value of €2.07 /kg is obtained. Thus, the Kriström non-parametric estimator produces a higher willingness to pay value than the Turnbull estimator. The Turnbull estimator is a conservative willingness to pay estimator, because it assumes that the mass of probability accumulates at lower bid interval probabilities.
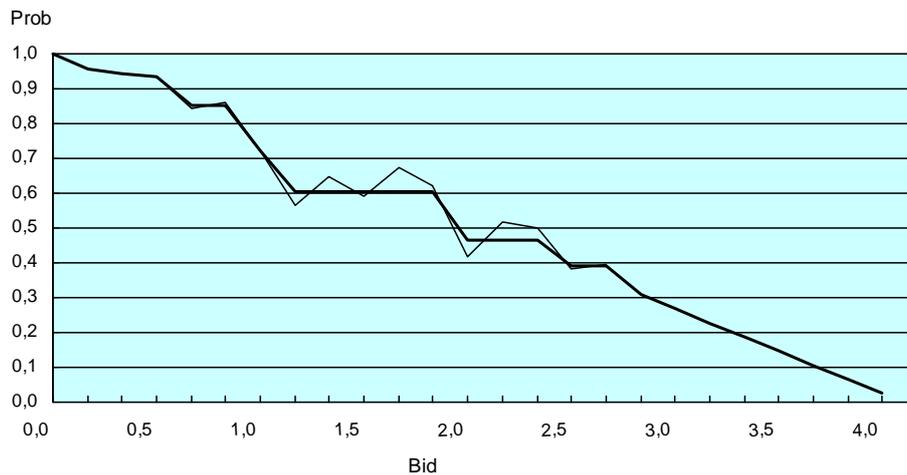
Figure 10. *Pooled empirical willingness to pay survival function, using linear interpolation. The thin line describes the original function.*

6.3 Summary of the willingness to pay estimation results

6.3.1 Factors explaining willingness to pay

In Chapter 3.3, four hypotheses were introduced:

(I) If there is not enough quality information on the food market, consumers are willing to pay for it and then indicate gaining utility from increased quality information.

(II) The higher the risk a consumer associates with food products, the greater is the value increase and willingness to pay for quality information.

(III) Personal and other people's negative experiences concerning food quality affect willingness to pay for quality information.

(IV) Trust in the providers of food quality information affects consumer willingness to pay for quality information.

The first binary model confirmed the premise that certain food-related risk factors and trust in the operators of the food chain do affect consumer willingness to pay. A fairly large proportion of the respondents, nearly 73% (protest responses were excluded from this study), were willing to pay for increased information related to the safety, origin and other quality attributes of beef. Based on the results, it can be stated that not enough quality information is available on the markets, and that the majority of consumers are willing to pay for quality information (Hypothesis I).

The results also showed that certain risk factors impact consumer willingness to pay. If the respondents considered genetic modification of food or foodborne zoonotic diseases as harmful or extremely harmful risk factors in food, they were more likely to be willing to pay for quality information. The results produced by the models thus confirmed the premise that certain food-related risks affect willingness to pay for beef quality information (Hypothesis II).

Based on the theoretical framework of this study, one might have assumed that personal and other people's negative experiences of illnesses caused by inferior food would increase willingness to pay and the need for quality information. However, the results of the binary logit model showed that only other people's negative experiences affected willingness to pay, while personal negative experiences of inferior food did not have a similar effect (Hypothesis III).

The fourth hypothesis based on the theoretical framework of this study anticipated that trust in the providers of information does affect willingness to pay, although the actual direction could not be predicted in the light of

earlier studies. This study demonstrated that willingness to pay is highly dependent on the respondents' trust in the providers of information, and that trust does increase consumer willingness to pay for beef quality information (Hypothesis IV).

6.3.2 Average willingness to pay for quality information

This study estimated average willingness to pay by applying a dichotomic willingness to pay question in three ways: parametrically using a logit model, and non-parametrically using the Turnbull and Kriström distribution-free estimators.

According to Carson and Hanemann (2005), a parametric estimation of average willingness to pay is meaningful in the following cases:

- (I)   the researcher seeks to use a specific utility function,
- (II) the researcher seeks to decrease the dependence of the estimation results on the points used in the survey,
- (III) the researcher seeks to use several covariants as explanatory factors, or
- (IV) instead of one single-bound bid question, the researcher also uses other information in the model, applying, e.g., semi-parametric models (An 2000).

According to An (2000), the possibility of multiple options may also be a weakness of the parametric approach, because it may result in model specification errors. Further, the assumptions of parametric models are often too restrictive. As a consequence, this may motivate the researcher to find the "right" model that produces the "correct" average willingness to pay results, aligned with the researcher's pre-conceived ideas. Occasionally, more complicated models do not necessarily converge, and the researcher is forced to set initial values based on intuition, or trial and error (Hanemann and Kanninen 1996). The two prevailing models, probit and logit models (Haab and McConnell 2002), were selected for use in this study.

In this study, the results of the logit and probit models deviated significantly from each other. Thus, the form of the function clearly has an impact on the average willingness to pay estimations in these research data. The logit model produced an average willingness to pay value of €1.97 /kg; the results of this model were therefore closer to the non-parametric estimations, and the coefficients were statistically significant. However, the results of the probit model were not statistically significant.

In the non-parametric calculations of willingness to pay, the result of the Turnbull estimator was €1.59 /kg and the respective result of the Kriström estimator was €2.07 /kg. These results indicated an approximate price increase of €1.88 /kg as the average willingness to pay value for beef.

In addition to the bid question, the respondents were proposed average prices per kg (Table 14). Assume that based on the above willingness to pay results, the respondents paid an average of €1.88 /kg more for beef (all zero bids excluded). Depending on the type of beef product, average willingness to pay thus translates to a price increase of 24% per kilo. This percentage figure is fairly close to the 20% price increase obtained by Enneking (2004), yet at the same time it remains noticeably lower than the results obtained by Loureiro and Umbergen (2007).

Table 14. *Average willingness to pay value for beef, and approximate percentage increases in consumer prices.*

	Price of beef*), euros (€) /kg	Average willingness to pay, euros (€)/kg	Price increase, %
Ground beef	5.55	1.88	34%
Rump roast	8.41	1.88	22%
Beef strips	9.08	1.88	21%
Average beef price	7.68	1.88	24%

*) Average consumer prices for beef in Finland during the last 12 months prior to the survey conducted in March 2000.

For comparison, the average prices in 2007 were €8.14 /kg for ground beef, €10.04 /kg for rump roast and €11.37 /kg for beef strips, respectively (Statistics Finland 2008).

6.4 Conclusions

The purpose of the empirical part of the study was to identify factors that explain consumer willingness to pay for increased quality information. According to the findings, consumer perceptions of specific risks in food partly explain their WTP. Other explanatory factors that increased willingness to pay were negative experiences heard from other people. This is clear indication that consumers fail to notice quality information, or that the information available on quality properties is not adequate in the market. Therefore they trust in quality signals that are inappropriate in their nature.

According to the results, it can be concluded that the majority of the respondents trust in the Finnish food safety authorities and the co-operation of all stakeholders in the food chain. Trust is a very important factor explaining willingness to pay. For some consumers, trust is linked with personal contact with storekeepers. For others, trust is linked with confidence in public authorities. These empirical findings form the most prominent scientific contribution of this study.

This study examined what kind of information consumers require to ensure quality and safety in the food chain. This study verified that consumers need more information on the quality of the food on the market. Finnish consumers require more information on the control of foodborne diseases on farms, the genetic modification of production animals and animal feed, and on the control of medical treatment of production animals. After the survey for this study was conducted in 2000, animal welfare became headline news in Finland at the turn of the years 2007 and 2008. This public discussion may heighten the need for information on the control of animal welfare.

One of the main findings of this study was that the majority of Finnish consumers (73%) regard increased quality information as beneficial. These benefits were assessed using the contingent valuation method. In this study, four different willingness-to-pay results were elicited. According to the results, three of them seemed to be quite close to each other. In the logit-model, two other variables (income, sex) were included in the model in addition to the bid variable. However, it seemed that the income variable did not have an effect on willingness to pay. In the non-parametric estimation, no other variables than the bid variable were utilised since the method does not allow the use of explanatory variables. The results showed that those who were willing to pay for increased information on the quality and safety of beef would accept an average price increase of 24% per kilogram. This figure is very similar to those obtained in earlier studies.

Based on the results, we can conclude that a relatively high proportion of the respondents, 42% (n = 696), was not willing to pay for quality information. Motives underlying this unwillingness to pay were queried in order to make it possible to identify in the sample those respondents who protested the actual valuation question or the valuation scenario. These respondents are called protest responses since they might protest the payment mechanism or the implementation of a policy change. Ethical reasons might also act as motivation for protest responses.

Results indicate that about 60% of the motives for unwillingness to pay represented so-called legitimate zero bids, i.e. respondents with no willing-

ness to pay for increased information on food quality and safety. The majority considered that the current labelling system guarantees sufficient food safety and quality. The motive with the second highest response rate was the inability to afford more expensive beef. The third most popular reason was lack of trust in package labelling, or that increased package labelling could ensure better quality. This is clearly a statement of no confidence in the capability of the system to guarantee safe meat.

About 28% of the responses could be interpreted as distinct protest responses. In this study, the respondents who gave even a single protest response were excluded from the statistical analysis. This is a common method in valuation studies. In consequence, the number of non-respondents decreased to 347, and that of the entire sample to 1,290 respondents. The proportion of those with genuine unwillingness to pay is about 27%.

7 DISCUSSION

In this study, a theoretical framework derived from the field of information economics was applied to the functioning of food markets. According to the theory, information available to purchasers can be classified into three categories depending on the ability of the buyers to determine differences in product quality. Firstly, a search good is one whose quality is determined before purchase. For example, in the case of food products, buyers can examine attributes such as colour, structure and extrinsic defects. Secondly, an experience good is one whose quality is determined after purchase on the basis of taste and composition. If we consider food safety issues, acute foodborne illnesses caused, for example, by *Salmonella*, EHEC or *Listeria* bacteria fall into this category. Thirdly, many of the characteristics related to the safety of foodstuffs are classified as credence attributes. The quality of a credence good cannot be determined either before or after purchase. In the case of credence goods and attributes such as heavy metals and herbicide residues, it may be very difficult to establish a connection between the quality of the original food product and the disease it may have caused. Most of the attributes used to define the quality of food fall into the credence category.

Stigliz (2002), one of the pioneers in the field of information economics, stated that the presence of even the slightest information imperfection has the tendency to affect market operation, whereby the traditional equilibrium of demand and supply cannot be achieved. It is clear that imperfect quality information exists on the food markets, and public actions are needed to guarantee a minimum safety level by regulating and controlling the markets.

Instead of public food control measures, the European Union is increasingly directing its food safety policy towards actions concerning all actors in the food chain. This development highlights the need for efficient communication of quality information throughout the food chain, from the very beginning to the very end. In this context, the operative word is traceability. The traceability of food enables the elicitation of additional quality information, while facilitating the communication of this information to consumers.

The literature in this study consists of three main themes: traceability; consumer behaviour related to both quality and safety issues and perception of risk; and valuation methods. As we can observe, most of the theoretical literature condensed for this research has been developed in 2000s. This indicates that at the time this study was launched in 1998, there were no

well-developed theoretical concepts available from earlier research for testing. This has also had an influence on the measurements used in this research, as most variables are qualitative in nature. However, the chosen topic has carried over to the present day and it has became even more relevant during the recent years.

The development of theoretical literature after the inception of this research also leads to the notion that the original research question presented in Chapter 1.2 is different from the hypotheses presented in Chapter 3.3. Some of the original research questions were more explanatory and more practical in nature. These questions are answered in Chapters 5.6 and 5.7. This study reveals that some theoretical concepts appeared very valid when explaining consumers willingness to pay.

Consumers base their food choices and quality evaluation on quality cues. Concerning meat products, consumers use various quality cues. Today, risk and safety are permanent elements within the concept of food quality. Safety, in particular, is the attribute that consumers find very difficult to assess. Based on previous research, the quality cues considered by consumers as the most significant for the selection of beef are freshness, information on animal feed, and information on the country of origin.

In this study, the willingness to pay question was posed as a two-staged willingness to pay question: the respondents were first queried whether they had any willingness to pay at all, whereafter bids were proposed to the respondents who indicated positive willingness to pay. This was clearly an improvement of the valuation method in that the respondents could be unambiguously divided into those willing to pay and those unwilling to pay, thus allowing the respondents with positive willingness to pay to be distinctly identified from the zero-respondents.

In further analyses, sample selection models such as Heckman's model (Heckman 1979) could be applied. The model could utilise the data with two sequential decisions. The first one is whether to pay or not to pay a positive amount. If the consumer is willing to pay a positive amount, the second decision is the actual amount. To improve modelling, it would be ideal to combine willingness to pay estimates and explanatory variables within a single model by incorporating zero responses. This was a genuine idea that could not be fully implemented. Chapter 4.4 highlights the general notions of the validity and reliability of the research method. To test the content validity of the estimation results, methods such as experimental auctions could also be applied in further research. In further studies, the survey form could also be improved by targeting the willingness to pay question at specific meat products.

This study also has a distinct managerial contribution to the operation of the food chain. The study produces new information on the consumers' evaluation of food. The results showed that certain risk factors impact consumer willingness to pay. If the respondents considered genetic modification of food or foodborne zoonotic diseases as harmful or extremely harmful risk factors in food, they were more likely to be willing to pay for quality information. The results produced by the models thus confirmed the premise that certain food-related risks affect willingness to pay for beef quality information.

The results also showed that safety-related quality cues are significant to the consumers. In the first place, the consumers would like to receive information on the control of zoonotic diseases that are contagious to humans. This is consistent with the fact that the consumers considered food-transmitted zoonotic diseases as the highest risk factor in food. Similarly, other process-control related information (e.g., information on the use of drugs and on the monitoring of heavy metals and slaughterhouses) ranked high among the top responses. Information on any potential genetic modification (the modification of animal genes, and the use of genetically modified animal feed) was also considered important, even though genetic modification was not regarded as a high risk factor.

Currently, Finnish beef production is struggling with rises in the prices of various production inputs. Although energy and fertiliser prices have markedly risen, producer prices have failed to reflect this development. The weakening profitability of beef production has fuelled the cessation of farming, partly affecting the shortage of domestic beef on the market. The challenge is to identify measures to improve the profitability of domestic beef production. The good quality and safety of Finnish beef needs to be signalled to consumers, thereby creating economic incentives for the producers and markets to produce high quality beef in a more consumer-oriented quality chain.

8 SUOMENKIELINEN SELOSTUS

**TIETO, RISKI JA LUOTTAMUS ELINTARVIKEKETJUSSA: NAUDAN-
LIHAN LAATUTIEDON LISÄÄMISEN TALOUDELLINEN ARVIOINTI
CONTINGENT VALUATION –MENETELMÄLLÄ**

Elintarvikkeiden turvallisuus herättää yhä enemmän tiedotusvälineiden ja kuluttajien kiinnostusta ja toisaalta myös huolta, kun elintarvikeriskeihin liittyvä tieto lisääntyy jatkuvasti. Elintarvikkeiden turvallisuus ja riskit nousivat esiin 1980-luvulla, kun saastuneet hampurilaiset aiheuttivat ihmisten kuolemantapauksia Yhdysvalloissa. Euroopassa ensimmäinen laajamittainen elintarviketurvallisuuteen liittyvä kriisi sai alkunsa Britanniasta levinneestä BSE eli ns. hullun lehmän taudista, jonka epäiltiin aiheuttavan ihmisillä todetun hermostoperäisen sairauden uutta muunnosta CJ-tautia. Syöpää aiheuttavien korkeiden dioksiinipitoisuuksien löytyminen elintarvikkeista sekä uhkakuvat globaalista eläinperäisten tautien leviämisestä ihmisiin, joista viimeisimpänä lintuinfluenssa, vaikuttavat siihen, että riski ja turvallisuus käsitteinä ovat tulleet jäädäkseen elintarvikkeista ja laadusta keskusteltaessa.

Suomessa kuluttajien luottamus elintarvikeketjun toimintaan on hyvä, ja toistaiseksi elintarviketurvallisuuteen liittyviä vakavia kriisejä ei ole koettu. Suomessa todettiin yksi BSE-tautitapaus lehmällä vuonna 2001, sen vaikutukset naudanlihan kulutukseen jäivät kuitenkin lyhytaikaisiksi. Myös lintuinfluenssa vaikutti siipikarjanlihan kulutukseen keväällä 2006, mutta senkin vaikutukset jäivät Suomessa muuta Eurooppaa huomattavasti vähäisemmäksi, kun varsinaisia tautitapauksia tuotantoeläimillä ei todettu (PTT Katsaus 2006).

Eurooppalaisen ruokaturvallisuuden parantamiseksi ja kuluttajien luottamuksen palauttamiseksi Euroopan komissio esitteli Valkoisessa kirjassaan[9] (COM 2000) elintarvikkeiden turvallisuudesta merkittäviä toimenpiteitä. Toimenpiteinä ehdotettiin muun muassa eurooppalaisen elintarviketurvallisuusviraston (EFSA) perustamista sekä pellolta pöytään -ajattelun vahvistamista elintarvikelainsäädännössä. Valkoisessa kirjassa painotetaan kaikkien elintarvikeketjun toimijoiden vastuuta elintarviketurvallisuudesta

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[9] Komission julkaisemat valkoiset kirjat sisältävät ehdotuksia tietyllä alalla toteutettavaksi yhteisön toiminnaksi. Valkoiset kirjat sisältävät tiettyjä politiikan aloja koskevia virallisia ehdotuksia. Niitä julkaistaan sen jälkeen, kun asiasta julkista keskustelua varten ja EU:n kuulemisprosessin käynnistämiseksi on ensin julkaistu vihreä kirja. Julkaistut asiakirjat ovat saatavilla: http://europa.eu/documents/comm/index_fi.htm

sekä jäljitettävyyden parantamisesta. Elintarvikkeiden laadun valvonta siirtyy yhä enemmän julkiselta sektorilta elintarvikeketjun toimijoiden vastuulle. Lisäksi Valkoisessa kirjassa korostetaan kuluttajien tarvetta saada selkeää ja täsmällistä tietoa elintarvikkeiden laadusta, mahdollisista riskitekijöistä ja koostumuksesta.

Suomessa kotimainen pellolta pöytään –laatuketju syntyi vuonna 1999, jolloin sitouduttiin kehittämään tuotteiden ja toiminnan laatua kansallisen laatustrategian avulla. Laatuvastuun siirtyminen yhä enemmän toimijoiden itsensä vastuulle korostaa luotettavan ja täsmällisen tiedon välittämistä koko elintarvikeketjussa aina kuluttajalle asti, jotta myös taloudelliset kannustimet laadun tuottamiseksi syntyisivät. Tämä taas edellyttää hyvää elintarvikkeen ja sen raaka-aineiden jäljitettävyyttä. Elintarvikkeiden jäljitettävyyttä on parannettu yrityksissä mm. omavalvontajärjestelmien kautta, ja erilaisten tuotetietojärjestelmien kehitystyö on elintarvikeketjussa tällä hetkellä käynnissä. Vuoden 2005 alusta astui voimaan EU:n asetus elintarvikkeiden jäljitettävyydestä (178/2002/EY). Naudanlihan jäljitettävyyden ja alkuperän ilmoittamista koskevat vaatimukset ovat tätäkin asetusta tiukemmat.

Syitä siihen, miksi elintarvikemarkkinoilla tarvitaan julkisen vallan sääntelyä esimerkiksi lainsäädännön avulla, on monia. Elintarvikkeiden turvallisuuteen ja laatuun liittyvät ominaisuudet ovat ns. julkishyödykkeitä. Termi viittaa taloustieteessä ominaisuuksiin, joita markkinat eivät usein hinnoittele oikein. Käytännössä tämä merkitsee sitä, ettei elintarviketurvallisuudelle eikä tuotteessa oleville elintarviketurvallisuusominaisuuksille synny markkinoilla hintaa eikä markkinamekanismi yksistään toimi tehokkaasti laadun tuottamisessa. Hyvälaatuisten tuotteiden tuottamisesta ei markkinoilla saada parempaa hintaa, vaikka laadun tuottamisen kustannukset olisivat korkeammat. Tilannetta kutsutaan taloustieteessä markkinoiden epäonnistumiseksi (*market failure*).

Markkinoiden toimimattomuus johtuu muun muassa tuotteen laatua koskevan täydellisen informaation puuttumisesta, ja sen seurauksena markkinoilla olevien hyödykkeiden laatutaso alenee. Koska markkinat eivät kykene toimimaan tehokkaasti elintarvikkeiden laadun tuottamisessa, tarvitaan julkisen sektorin toimia turvaamaan markkinoilla olevien elintarvikkeiden vähimmäislaatutaso.

Julkisen sektorin ja toimijoiden omien laadunvalvonnan ja laatustandardoinnin ohella voidaan politiikkatoimenpiteenä käyttää myös informaatio-ohjausta. Pakkausmerkinnät ovat informaatio-ohjauksen eräs muoto. Elintarvikemarkkinoilla pakkausmerkinnät voivat olla sekä julkisen sektorin säätelemiä pakollisia pakkausmerkintöjä että yritysten omia vapaaehtoisia

merkintöjä, joilla yritetään saada tuotteen erityislaatu esiin kilpaileviin tuotteisiin verrattuna.

Elintarvikeketjussa tietoa elintarvikkeiden laadusta ja turvallisuudesta kertyy yhä enemmän, mutta kuluttajan saatavilla oleva informaatio ei ole kovin merkittävästi lisääntynyt, vaikka elintarviketalouden kehitystyössä tavoitteena on kuluttajalähtöisyyden huomioiminen. Tutkittua tietoa kuluttajien tietotarpeista on toistaiseksi vain vähän saatavilla.

Tässä tutkimuksessa selvitettiin, millaisia ja kenen tuottamia informaatiovirtoja tarvitaan laadun ja turvallisuuden todentamiseksi elintarvikeketjussa. Kuluttajien maksuhalukkuuden määrittämisellä selvitettiin, onko naudanlihan turvallisuutta ja laatua koskevaa informaatiota kuluttajien mielestä riittävästi saatavilla. Tämä on myös selvä tutkimuksen tuottama käytännön kontribuutio. Tutkimuksen empiirinen osa rajattiin koskemaan naudanlihaa, koska naudanlihan merkintäjärjestelmä tarjoaa mahdollisuuksia jäljittää luotettavasti lihan alkuperä sekä turvallisuutta, ympäristöystävällisyyttä ja eläinten hyvinvointia koskevia ominaisuuksia.

Tutkimuksen kysymyksenasettelu johtaa kvantitatiivisten, taloudellisten suureiden hakemiseen politiikkamuutoksesta eli informaation tarjoamisesta elintarvikkeiden turvallisuudesta ja laadusta. Ilmiö sisältää kaksi dimensiota: toisaalta informaation ja toisaalta elintarvikkeiden turvallisuuden, jotka ovat keskenään toisistaan riippuvaisia. Informaatio, joka koskee tietyn tuotteen ominaisuuksia, on jo itsessään hyödyke. Lisäksi näillä kummallakin ominaisuudella on yhteinen piirre, julkishyödykemäisyys.

Tässä tutkimuksessa informaation taloustieteen teoriaviitekehystä sovellettiin elintarvikemarkkinoiden toimintaan. Kuluttajan saatavilla oleva laatuinformaatio voidaan jaotella kolmeen kategoriaan riippuen siitä, miten hyvin kuluttaja kykenee laatuominaisuuksia varmistamaan. Ensiksi, ostaja kykenee määrittelemään laatua ulkoisesti havaittavien tuotteen ominaisuuksien perusteella: esimerkiksi elintarvikkeiden osalta kuluttaja tarkastelee mm. väriä, rakennetta, ulkoisia vikoja sekä hintaa. Toiseksi, välittömästi kulutuksen jälkeen ostaja voi arvioida elintarvikkeita maun ja koostumuksen perusteella. Esimerkiksi elintarvikkeiden turvallisuuden osalta tällöin ilmenevät akuutit ruokamyrkytyksen aiheuttajat, kuten salmonella, ehec- ja listeriabakteerit. Kolmanneksi tulevat vasta pidemmällä aikavälillä havaittavat elintarviketurvallisuusriskit, kuten esimerkiksi raskasmetallit ja torjunta-ainejäämät.

Pitkällä aikavälillä havaittavissa elintarvikeriskeissä alkuperäisen elintarvikkeen laadun ja siitä mahdollisesti aiheutuvan sairauden yhteyttä on usein vaikea havaita. Esimerkiksi Suomessa tilastoiduissa elintarvikevälitteisissä ruokamyrkytystapauksissa lähes puolessa tapauksista sairauden

aiheuttajaa bakteeria tai virusta ei saada selville. Lisäksi useimmat lievemmät tapaukset jäävät tilastojen ulkopuolelle. Elintarvikkeiden turvallisuus sisältää useita attribuutteja, joita kuluttajan on vaikea arvioida itse, ja laadun suhteen hän joutuu luottamaan pelkästään myyjään tai valmistajaan. Näitä ominaisuuksia kutsutaan luottamusperäisiksi ominaisuuksiksi *(credence)*.

Informaation taloustieteen paradigman uranuurtajista Stiglitz (2002) on todennut, että jos markkinoilla esiintyy vähäisissäkin määrin informaatio-ongelmia, markkinat tuskin löytävät perinteisen mallin mukaisen kysynnän ja tarjonnan tasapainoa. Elintarvikemarkkinoilla on selvää, että etenkin laadun ja turvallisuuden suhteen ostajilla ei ole välttämättä tietoa elintarvikkeen laatuominaisuuksista ja siten elintarvikkeiden laatutason ylläpitämiseksi tarvitaan elintarvikemarkkinoiden sääntelyä lainsäädännön ja elintarvikevalvonnan keinoin.

Euroopan unionissa elintarviketurvallisuuspolitiikkaa suunnataan yhä enemmän julkisen sektorin valvonnan sijasta elintarvikeketjun eri toimijoiden suuntaan, jolloin laatutiedon välittyminen kuluttajille saakka elintarvikeketjussa korostuu entisestään. Toisaalta tuotteiden jäljitettävyys edesauttaa laadukkaampien ja turvallisempien elintarvikkeiden tuottamista.

Aikaisempien tutkimusten perusteella kuluttajat muodostavat elintarvikkeen laatukäsityksen perustuen laatuvihjeisiin. Lihatuotteilla näitä laatuvihjeitä on useita, mutta ostotilanteessa kuluttajat käyttävät vain muutamaa vihjettä, kuten lihan rasvapitoisuutta ja ostopaikkaa.

Riski ja elintarvikkeiden turvallisuus ovat nykyään olennaisia käsitteitä elintarvikkeiden laadun osatekijöinä. Turvallisuus on luottamusperäinen ominaisuus, jonka arvioiminen kuluttajalle on erityisen vaikeaa. Aikaisempien tutkimusten perusteella on todettu, että merkittävimpinä laatuattribuutteina naudanlihalla kuluttajat pitävät tuoreutta, tietoa eläimen ruokinnasta ja alkuperämaata.

Tämä tutkimus osoitti, että suurin osa suomalaisista kuluttajista (73 %) kokee hyötyvänsä uusien naudanlihan laatua ja erityisesti turvallisuutta kuvaavien laatutietojen lisäämisestä. Tutkimuksessa kuluttajien kokemaa hyötyä laatutiedon lisäämisestä selvitettiin kuluttajien maksuhalukkuuden avulla. Tutkimusmenetelmänä oli contingent valuation –menetelmä. Ne kuluttajat, jotka ilmoittivat maksuhalukkuudestaan, maksaisivat laatutiedosta noin 24 prosenttia naudanlihan kilohintaan lisää. Summa on samansuuruinen kuin vastaavantyyppisissä tutkimuksissa.

Tutkimuksen perusteella kuluttajat kaipaavat elintarvikemarkkinoille lisää laatutietoa. Suomalaiset kuluttajat kaipaavat nykyisten pakkausmerkintöjen lisäksi tietoa tilavalvonnoista eläintautien suhteen, eläinten

geenimuuntelusta ja lääkeaineiden käytön valvonnasta. Lisäksi kyselyn toteuttamisen jälkeen Suomessa eläinten hyvinvointi nousi voimakkaasti esiin vuodenvaihteessa 2007-2008.

Tutkimuksessa selvitettiin maksuhalukkuutta selittäviä tekijöitä ja osoitettiin, että kuluttajan riskin kokeminen haitallisiksi elintarvikkeissa, toisten huonot kokemukset ja luottamus ketjun toimijoihin selittävät eniten kuluttajien maksuhalukkuutta. Empiirisesti näitä muuttujia ei ole testattu aiemmin, ja tämä on selvä tutkimuksen tuottama tieteellinen kontribuutio.

Luottamus elintarvikeketjun toimijoihin on hyvin keskeinen kuluttajan maksuhalukkuutta selittävä tekijä. Joillekin vastaajille se on luottamusta kauppiaan tarjoamaan lihaan, joillekin luottamusta elintarvikevalvonta-viranomaisiin ja osalle vastaajista koko elintarvikeketjun tuottamaan tietoon. Suomessa kuluttajien luottamus on pysynyt varsin vakaana eikä suuria elintarvikekriisejä ole meillä esiintynyt. Elintarvikkeiden turvallisuus on siksi kuluttajalle lähes aina luottamukseen perustuva laatuominaisuus ja laatutiedon lisääminen näistä ominaisuuksista hyödyttää suurinta osaa suomalaisista kuluttajista.

Kotimainen kansallinen laatustrategia pyrkii kokoamaan hajallaan olevan laatutiedon elintarvikealan laatutietojärjestelmään. Laatustrategiassa tunnistetaan kotimaisen tuotannon kilpailueduksi jäljitettävyys ja kotimai-seen tuotantoon ja tuotantotapaan liittyvä tieto. Oleellista elintarvikeketjun toiminnan kannalta on, että kuluttajien tietotarpeista keskeisimmät laatu-vihjeet kyetään viestittämään elintarvikeketjussa luotettavasti aina kulutta-jalle asti.

Tällä hetkellä suomalainen naudanlihantuotanto taistelee useiden tuotantopanosten hinnannousua vastaan. Tuottajahintojen nousu ei ole pysynyt energian ja tuotantopanosten hintojen nousun tahdissa. Kannatta-vuuden aleneminen on kiihdyttänyt tuotannosta luopumista, ja siten kotimaisen naudanlihan tarjonta on pienentynyt. Elintarvikeketjun haasteena on tunnistaa ne toimenpiteet, joilla kotimaisen naudanlihantuotannon talou-dellisia edellytyksiä vahvistetaan. Suomalaisen naudanlihan erinomainen laatu pitäisi saada myös kuluttajien tietoisuuteen. Tämä loisi paremmat taloudelliset kannustimet tuottajille. Siten laatutiedon lisääntyessä markkinat tuottaisivat korkealaatuista naudanlihaa kuluttajien vaatimusten mukaisesti suuntautuvassa elintarvikeketjussa.

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APPENDIX

Survey Form

GallupKanava, week 09/2000

Label	Variable	Coding	Recoding for the binary model
Code number for household	TALOUS		
Code number for individual	HLO		
How often do you have a meal made from beef?	NAUTA1	1 = daily 2 = several times a week 3 = about once a week 4 = twice or three times a month 5 = about once a month 6 = rarely 7 = never	Rarely eats beef: 1 = rarely or never, 0 = otherwise
Do you ever, or even very infrequently, buy beef?	NAUTA2	1 = yes 2 = no	Buys beef : 1 = yes, 0 = no
I BUYING AND COOKING BEEF			
When you are buying beef, how often do you choose it… … from a meat clerk at a meat counter?	V0138	1 = never 2 = occasionally 3 = about every second time 4 = almost every time 5 = every time	
… from a self-service shelf, packaged by the store (styrofoam tray, plastic wrapping)?	V0139	same as above	
… from a self-service shelf, industrially packaged?	V0140	same as above	
… directly from a producer?	V0141	same as above	

When you are buying beef, how often do you take into consideration the following information or attributes? … "use by" date	V0142	same as above	Checks the "use by" date in the current package labelling: 1 = every time or almost every time, 0 = otherwise
… producer	V0143	same as above	
… price	V0144	same as above	
… fat content	V0145	same as above	
…"Finnish beef" marking	V0146	same as above	Checks the Finnish beef marking in the current package labelling: 1 = every time or almost every time, 0 = otherwise
… producer's quality label	V0147	same as above	
… colour of the beef	V0148	same as above	
… production date or packaging date	V0149	same as above	
… organic food label	V0150	same as above	Checks the organic food label in the current package labelling: 1 = every time or almost every time, 0 = otherwise
… Finnish food label	V0151	same as above	
Before buying beef, how often do you find out its country of origin, e.g., from a meat counter clerk, shelf signs or packaging?	V0152	same as above	
If information on the origin of beef used in a meal e.g. at a workplace cafeteria or restaurant is not readily available, how often do you find out about it?	V0153	same as above	
In your household, how	V0154	1 = never	

often do you prepare a meal containing beef… …from untreated whole meat, completely by yourself from beginning to end (e.g., tenderloin or filet mignon, rump roast)?		2 = less often than once a month 3 = 1-3 times a month 4 = 1-2 times a week 5 = several times a week	
In your household, how often do you prepare a meal containing beef… …from ground beef?	V0155	same as above	
… from pre-sliced or cubed, or pre-marinated or breaded beef, etc.?	V0156	same as above	
… from pre-cooked beef foodstuffs (pre-cooked meatballs, sausages, etc.)?	V0157	same as above	
… prepared ready-to-eat meals which require heating (microwave meals, etc.)?	V0158	same as above	
II OPINIONS ON BEEF AND ITS SAFETY			
What do you think about the following statements? In Finland, the authorities responsible for food safety make sure that the beef sold in the stores is… … safe to eat up to and including its "use by" date	V0159	1 = completely disagree 2 = somewhat disagree 3 = neither disagree nor agree 4 = somewhat agree 5 = completely agree	
… I only ever buy beef on special offer	V0160	same as above	
… imported beef is as safe as Finnish beef	V0161	same as above	
… quality beef is not usually cheap to buy	V0162	same as above	
… industrially packaged beef is safer than store-packaged beef	V0163	same as above	
… beef-related incidents	V0164	same as above	

are caused by the fact that producing high-quality beef does not pay well enough			
… I trust that the storekeeper will sell only safe beef to the customers	V0165	same as above	Has trust in storekeepers: 1 = completely or somewhat agree, 0 = otherwise
In food, how harmful do you consider the following: … excessive fat	V0166	1 = very harmful 2 = fairly harmful 3 = somewhat harmful 4 = not harmful at all 5 = cannot say	
… pesticide and herbicide residues	V0167	same as above	
… additives and preservatives	V0168	same as above	
… nitrate and nitrite	V0169	same as above	
… environmental pollutants (lead, cadmium, PCB,PAH)	V0170	same as above	
… excessive sugar	V0171	same as above	
… drug residues (hormones, antibiotics)	V0172	same as above	
… excessive salt	V0173	same as above	
… diseases transmitted from animals to humans (e.g., Salmonella, EHEC, campylobacteria)	V0174	same as above	Considers foodborne zoonotic diseases harmful: 1 = very or fairly harmful, 0 = somewhat / not harmful at all / cannot say
… genetically modified organisms (GMO) in animal feed, or genetic modification of animals	V0175	same as above	Considers genetic modification of food harmful: 1 = very or fairly harmful 0 = somewhat / not harmful at all / cannot say

III WILLINGNESS TO PAY FOR INFORMATION ON FOOD SAFETY AND QUALITY In Finland, the stakeholders in the food chain (producers, food processing industry, retail sector, consumers and public authorities) have agreed on common goals through which attributes related to the quality and safety of Finnish food can be demonstrated to the consumers. More information on food quality and safety will be communicated to the consumers using a quality information system which is currently under development. Do you believe that such quality information as described above, produced by all stakeholders in the food chain, creates added value for Finnish food (= benefit to consumers)?	NAUTA39	1 = yes 2 = no 3 = cannot say	

Please read the following before responding to further questions. Information on the beef labelling system. The labelling system used in Finland allows beef to be traced back to the farm and animal it came from. The labelling process begins when a calf is born, with the insertion of yellow eartags in both ears. The eartag carries an individual bovine ID that stays with the animal for its whole lifetime. The owner reports the details of an eartagged calf to the bovine register, which is maintained by the public authorities. The sale of an animal from one farm to another is always reported to the register. The last report made by the owner specifies the slaughterhouse to which the animal was sent. On one eartag the animal carries a number that allows the tracing of information on its feeding and possible illnesses and medication. The bovine ID follows the carcass in the slaughterhouse, and all the way to the store. What does the beef labelling system mean to the consumer? Through the labelling system, the consumers can be given information on the animal from which the beef was produced. Before buying	NAUTA40	1 = yes 2 = no	

beef, the consumer could also receive information on the feeding and any medication given to the animal, on animal welfare, and on aspects related to the environmental impact of the production process. In terms of food safety, it would mean information on quality control, and on the safety of Finnish beef. Would you be willing to pay for the creation and maintenance of an information system that provided you with better information on the origin, production method and safety of beef?			
Would you be willing to pay FIM 2 /kg more than currently, for more information on the safety, origin and production method of beef? If necessary, refer to the following price listing. PRICE LISTING Average consumer beef prices in Finland during the last 12 months. - ground beef FIM 33 /kg - rump roast FIM 50 /kg - beef strips FIM 54 /kg	V0181	1 = yes 2 = no	
willing to pay FIM 3 /kg MORE	V0183	1 = yes 2 = no	
willing to pay FIM 4 /kg MORE	V0185	same as above	
willing to pay FIM 5 /kg MORE	V0187	same as above	
willing to pay FIM 6 /kg MORE	V0189	same as above	

willing to pay FIM 7 /kg MORE	V0191	same as above	
willing to pay FIM 8 /kg MORE	V0193	same as above	
willing to pay FIM 9 /kg MORE	V0195	same as above	
willing to pay FIM 10 /kg MORE	V0197	same as above	
willing to pay FIM 11 /kg MORE	V0199	same as above	
willing to pay FIM 12 /kg MORE	V0201	same as above	
willing to pay FIM 13 /kg MORE	V0203	same as above	
willing to pay FIM 14 /kg MORE	V0205	same as above	
willing to pay FIM 15 /kg MORE	V0207	same as above	
willing to pay FIM 16 /kg MORE	V0209	same as above	
For increased information on the safety, origin and production method of beef, I would be willing to pay CHECK THE APPROPRIATE OPTION … maximum FIM 2 /kg more … maximum FIM 3-5 /kg more … maximum FIM 6-7 /kg more … maximum FIM 11-12 /kg more … maximum FIM 13-15 /kg more … over FIM 16 /kg more	NAUTA42	1= maximum FIM 2 /kg 2= maximum FIM 3-5 /kg 3= maximum FIM 6-7 /kg 4 = maximum FIM 8-10 /kg 5 = maximum FIM 11-12 /kg 6 = maximum FIM 13-15 /kg 7 = >FIM 16 /kg more	

If you responded NO to question NAUTA40 I am not willing to pay more for increased information on the safety, origin and production method of beef, because… … I do not know exactly what information would be available	V0212C01	1 = yes 2 = no	
… the origin and quality of food is not important to me	V0212C02	same as above	
… I cannot afford to buy more expensive food	V0212C03	same as above	
… current labelling provides enough information	V0212C04	same as above	
… food products are always risky, regardless of where they were produced and labelled	V0212C05	same as above	
… another reason, what? (Please write your response in the space below.)	V0212C99	same as above	
IV REQUIREMENTS FOR BEEF-RELATED INFORMATION			
How important would you consider the following information on beef, in addition to the currently available information? Origin: country of origin?	V0213	1 = not important at all 2 = 2 3 = 3 4 = 4 5 = very important	
Origin: region of origin (e.g., province, county)?	V0214	same as above	
Origin: production farm?	V0215	same as above	
Origin: production animal	V0216	same as above	
Production animal: breed?	V0217	same as above	
Production animal: age?	V0218	same as above	
Production animal: sex?	V0219	same as above	
Drugs: has the animal been given any medication?	V0220	same as above	
Drugs: has the animal been given any hormones?	V0221	same as above	

Genetic modification: has the production animal been subject to genetic modification?	V0222	same as above	
Genetic modification: do animal feeds contain genetically modified material?	V0223	same as above	
Operation of the beef production chain: when was the animal slaughtered and how long did it take for the beef to reach the consumer (duration of beef production process)?	V0224	same as above	
Operation of the beef production chain: how long does animal transportation take?	V0225	same as above	
Price of beef: how much is the producer paid?	V0226	same as above	
Price of beef: how much are other stakeholders in the food chain paid (food industry, retail sector?)	V0227	same as above	
Production method: does the production farm have an agricultural quality control certification, ISO 9002 and/or ISO 14001?	V0228	same as above	
Production method: what kind of animal feeds does the farm use (e.g., domestically produced, Salmonella-free)?	V0229	same as above	
Production method: control of animal welfare and conditions?	V0230	same as above	
Production method: is attention paid to nutrient washout?	V0231	same as above	
Production method: is attention paid to the reduced use of pesticides and herbicides?	V0232	same as above	
Production method: do the animals have free-range, outdoor access?	V0233	same as above	

Control information: what control procedures are in place on farms against diseases transmitted from animals to humans (Salmonella, EHEC)?	V0234	same as above	
Control information: how is the use of antibiotics and other veterinary drugs controlled?	V0235	same as above	
Control information: inspections of slaughterhouses and inspection results?	V0236	same as above	
Control information: how often is beef inspected for heavy metals and pesticide and herbicide residues?	V0237	same as above	
Control information: how often is beef inspected for EHEC and Salmonella bacteria?	V0238	same as above	
In addition to the issues listed above, are there other beef-related details on which… …you would like to receive more information?	V0239	1 = yes 2 = no	

In your opinion, who would you consider the most reliable provider of information on food safety?
 	
CHOOSE ONLY ONE OPTION
   Finnish food control authorities
   Private research laboratories equipped for quality inspections
   The whole food chain together (producers, food processing industry, retail sector, consumers, agricultural expert organisations, research organisations and public authorities)
   A centralised food safety authority maintained by the European Union
food industry and food businesses?
   Consumer organisations
   Someone else, who? (Please write your response in the space below.)
   Cannot say
	NAUTA71	1 = Finnish authorities
		2 = private research laboratories
		3 = everyone in the food chain
		4 = EU food safety authority
		5 = food industry and food businesses
		6 = consumer organisations
		98 = someone else
		99 = cannot say
			Dummy variable which takes value 1 if respondent choose the provider of information, and 0 otherwise;
			
			Has trust in the information provided by the Finnish authorities;
			
			Has trust in the information provided by the whole food chain together;
			
			Has trust in the information provided by private research laboratories;
			
			Has trust in the information provided by consumer organisations;
			
			Has trust in the information provided by the food industry;
			
			Has trust in the information provided by the European Union authorities

In your opinion, who would respond fastest (communication, necessary actions) to a potential health hazard to humans? CHOOSE ONLY ONE OPTION 　Finnish food control authorities 　A centralised food safety authority maintained by the European Union 　The food business owning the product 　Consumer organisations 　Someone else, who? (Please write your response in the space below.) 　Cannot say	NAUTA72	1 = Finnish authorities 2 = EU food safety authority 3 = food business owning the product 4 = consumer organisation 98 = someone else 99 = cannot say	

In your opinion, who has the best information on food safety? CHOOSE ONLY ONE OPTION 　Finnish food control authorities 　Private research laboratories equipped for quality inspections 　The whole food chain together (producers, food processing industry, retail sector, consumers, agricultural expert organisations, research organisations and public authorities) 　A centralised food safety authority maintained by the European Union 　The food industry and food businesses? 　Consumer organisations 　The media 　Someone else, who? (Please write your response in the space below.) 　Cannot say	NAUTA73	1 = Finnish authorities 2 = private research laboratories 3 = everyone in the food chain 4 = EU food safety authority 5 = food industry and food businesses 6 = consumer organisations 7 = media 98 = someone else 99 = cannot say	
Have you heard or read about the following, mostly European, discussions related to food safety? CHECK ALL SUBJECTS YOU HAVE HEARD OR READ ABOUT … Salmonella	V0243C1	1 = yes 2 = no	
… EHEC bacterium, or enterohaemorrhagic Escherichia coli	V0243C2	same as above	
… use of antibiotics in animals	V0243C3	same as above	
… mad cow disease or BSE	V0243C4	same as above	

… genetic modification of animal feed materials or production animals	V0243C5	same as above	
… use of hormones in beef production	V0243C6	same as above	
… use of waste sludge in animal feeds	V0243C7	same as above	
… dioxin in animal feeds	V0243C8	same as above	
… I have neither heard nor read about any of the issues listed above	V0243C9	same as above	
Have you yourself, or has a member of your family fallen sick from inferior food (in Finland or abroad)?	NAUTA75	1 = yes 2 = no 3 = cannot say	
Do you have a relative or friend who has fallen sick from inferior food (in Finland or abroad)?	NAUTA76	same as above	Knows or has heard of people who have fallen sick from inferior food: 1 = yes 0 = no / cannot say
How common do you consider illnesses caused by food made in Finnish households?	V0246	1 = very rare 2 = fairly rare 3 = fairly common 4 = very common 5 = cannot say	
How common do you consider illnesses caused by food made at Finnish workplace cafeterias, hospitals or schools?	V0247	same as above	
How common do you consider illnesses caused by food made at Finnish restaurants?	V0248	same as above	
How common do you consider food-caused illnesses in Finland?	V0249	same as above	

How common do you consider illnesses caused by food made elsewhere in Europe?	V0250	same as above	
Are you familiar with the primary production of beef (farms)? CHOOSE ONLY ONE OPTION …yes, I am a beef producer myself …yes, I have connections with beef production through family members, relatives or friends …yes, I have visited a beef farm …yes, my occupation or training is closely related to beef production …yes, for a reason not specified above …no, I am not familiar with beef production, nor do I have any connections with beef producers	NAUTA82	1 = 'yes, is a beef producer' 2 = 'yes, has connections' 3 = 'yes, has visited a beef farm' 4 = 'yes, through occupation' 5 = 'yes, for another reason' 6 = 'not familiar'	
Do any of your family members have one of the following special diets? CHECK ALL DIETS IN YOUR FAMILY …vegetarian	V0256C1	1 = yes 2 = no	
…low-lactose or completely lactose-free	V0256C2	same as above	
…low-fat	V0256C3	same as above	
…low-salt or salt-free	V0256C4	same as above	
…gluten-free	V0256C5	same as above	
…other special diet	V0256C6	same as above	
…no special diets	V0256C7	same as above	
Sex of respondent	T1	1 = female 2 = male	

Age of respondent	T2	01-24 = '<= 24 yrs' 25-34 = '25-34 yrs' 35-44 = '35-44 yrs' 45-54 = '45-54 yrs' 55-99 = '>= 55 yrs' other = 'other/cannot say/no response'	
Size of household	T9	1 = 1 person 2 = 2 persons 3 = 3 persons 4-99 = 4 persons other = other/cannot say/ no response	
Occupation	T101	1,2 = managerial or high-level position 3 = low-level position 4 = employee 5,6 = self-employed / farmer 9 = retired 7,8,10,11 = other other = other/cannot say/no response	

Gross income of household	T102	1-4 = maximum FIM 8.000 /month 5-6 = FIM 8.001-14.000 /month 7-8 = FIM 14.001-22.000 /month 9-11 = minimum FIM 22.001 /month 12,13 = cannot say/no response	
Type of residential area	T103	1 = city or town centre 2 = suburban 3 = semi-urban 4 = rural, sparsely populated	
Party voted in 1999?	T104	1 = Social Democratic Party 2 = Centre Party of Finland 3 = National Coalition Party 4 = Left Alliance 5 = Green League 6-11 = other party 12 = did not vote 13-14 = will not say other= other/cannot say/no reponse	
Responsible for grocery shopping	T105	1 = yes, alone 2 = yes, shares responsibility 3 = no other = cannot say/no response	Has responsibility for grocery shopping, alone or together with someone else: 1 = yes, alone or yes, shares responsibility: 0 = otherwise

Special diets	T106	1 = vegetarian 2 = yes, some 3 = none other = cannot say/no response	
Region of residence	T107	1 = Uusimaa region 2 = Southern Finland 3 = Eastern Finland 4 = Central Finland 5 = Northern Finland	
Age of children	T108	1 = no children 2 = children under 6 years of age 3 = children over 6 years of age other = cannot say/no response	
Net income of household	T109	1-5000 = maximum FIM 5.000 /month 5001-10000 = FIM 5.001-10.000 /month 10001-15000 = FIM 10.001-15.000 /month 15001-high = over FIM 15.001 /month other = cannot say/no response	

Level of vocational or academic education or training	T110	1,7 = no vocational or academic training /other 2 = vocational training course 3 = vocational school etc. 4 = lower-level vocational or academic training or education 5,6 = higher-level vocational or academic training or education other = cannot say/no response	
Basic education	T111	1 = primary school (pre-1970s system) 2 = middle school (pre-1970s system), or comprehensive school (post-1970s system) 3 = upper secondary school other = cannot say/no response	

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