

A monitor for consumer confidence in the safety of food

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To oma and Kyra, the oldest and youngest person I love



Abstract

Despite the fact that in the developed countries food safety standards are higher than ever, food safety incidents continue to occur frequently. The accumulation of food safety incidents might affect general consumer confidence in the safety of food. Therefore, in this thesis, the concept of general consumer confidence in the safety of food is further conceptualised, and embedded within an integrative framework that incorporates both its antecedents and consequences. General consumer confidence in the safety of food is determined by 1) consumer trust in societal actors, 2) consumer recall of food safety incidents and media coverage, 3) the perceived safety of different product groups, and 4) socio-demographic and personality characteristics. The behavioural consequences of general consumer confidence relate to information search and particular food choice behaviours.

A measure for general consumer confidence in the safety of food is developed, showing that the construct consists of two distinct, although correlated, dimensions: optimism and pessimism. In the thesis, the construct of general consumer confidence in the safety of food is validated within its nomological network. The results show that optimism and pessimism are activated by different sources, and that consumer trust in societal actors, and consumer perceptions of the safety of meat are the strongest determinants of general consumer confidence in the safety of food. The framework is shown to be stable over time, and found to be applicable to an international context. In terms of the relationship between general consumer confidence in the safety of food and its behavioural consequences, it is shown that consumers low in general confidence in the safety of food are more likely to revert

to specific risk relief strategies. A more in depth analysis of the role of trust in societal actors in shaping general consumer confidence in the safety of food, shows that the strength of the relationship between trust and general consumer confidence in the safety of food depends on the specific food chain actor, the specific dimension of trust, as well as the specific combinations between actors and different dimensions of trust.

Overall, this thesis has extended existing research that largely focused on consumer perceptions of specific food-related hazards, by developing and validating an integrative framework of general consumer confidence in the safety of food. This research informs stakeholders that share responsibility on food safety about how confidence develops in the complex environment of the food production system, and provides risk managers and communicators, as well as other stakeholders, with important insights and tools to better respond to consumer concerns about food safety issues.

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While I have been looking forward to completing my thesis and writing the acknowledgements, until finishing the last chapter it was hard to believe that this moment was approaching. I have very much enjoyed the past five years during which I conducted this research. It has been a very instructive time, not only in terms of the PhD research itself, but also because my appointment at Wageningen University was my first ‘real’ job. The mottos ‘just start now’ and ‘kill your darlings’ have been very helpful. The first expression prevented me from staring at a flashing cursor on a blank (digital) sheet of paper, and the latter helped me to write efficiently. Whereas writing a PhD thesis is a personal achievement, it is, fortunately, not a project carried out alone.

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1

General introduction

Food safety has been recognised, nationally and internationally, as an important issue for society. Despite the fact that food safety standards are higher than ever in the developed countries (National Institute for Public Health and the Environment, 2006), food safety incidents continue to occur frequently. In past decades, consumers have been confronted with various food safety incidents, such as Bovine Spongiform Encephalopathy (BSE), the presence of dioxins in the food chain, the illegal Para Red and Sudan dyes in food products, and the forbidden Medroxy Progesterone Acetate (MPA) hormone in animal feed. Such incidents have had a profound impact on public health, trade bans, culling of animals, decreased consumption of products, and damage to the image of the food industry (Buzby, 2001; Verbeke, 2001). In addition, food safety incidents and the identification of new potential food safety hazards (e.g., emerging bacteria, Polycyclic Aromatic Hydrocarbons (PAHs), and acrylamide in foods), have resulted in increased media attention to food safety issues, and, at least in some cases, have resulted in reduced consumer confidence in food risk management (Frewer & Salter, 2002).

The process of risk analysis is continuously challenged by the occurrence of food safety incidents, the complexity of food chains, the increased internationalisation of trade, the potential of some hazards to cross international boundaries, and the identification of new food related hazards (see, for example, Halkier & Holm, 2006; Houghton et al., 2008; Sofos, 2008). Over the last decade, new food safety authorities have been established as a response to the societal need to effectively assess, and manage, food hazards, and to provide effective risk communica-

tion to the public (Halkier & Holm, 2006; O'Rourke, 2001). In 2002, the European Food Safety Authority was established, together with a number of national food safety agencies, such as the Dutch *Food and Consumer Product Safety Authority*, the British *Food Standards Agency*, and the Swedish *National Food Administration*.

In addition, new food safety standards and regulations have been introduced with the aim of increasing transparency in risk analysis and improving food safety levels. To ensure the traceability of food and feed through the whole chain ('from farm to fork'), the immediate supplier and the immediate subsequent recipient of a product should be known by food and feed business operators in specific food chains (see Regulation (EC) 178/2002). In addition, food business operators are obliged to implement food safety programs and procedures based on the Hazard Analysis Critical Control Points (HACCP) principles. Regarding the labelling of foodstuffs, new regulations have come into force, which require that comprehensive information about the contents and composition of food products is provided to consumers (see EU Directive 2003/89/EC amending Directive 2000/13/EC). Besides improving food safety *per se*, an important goal of food safety authorities is to strengthen consumer confidence in the safety of food (Houghton et al., 2006; Regulation (EC) 178/2002). As a result, there is a need to understand the concept of consumer confidence in the safety of food, together with the determinants and consequences of consumer confidence.

The concept of general consumer confidence in the safety of food has not been addressed in previous research that has aimed to investigate consumer perceptions associated with food safety. Previous research has typically been specific in nature, focusing on specific areas of interest. Examples include research aiming to understand how hazards are perceived by consumers in terms of various risk characteristics, such as the extent to which these food hazards are known and dreaded (e.g., Fife-Schaw & Rowe, 1996; Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978; Kirk, Greenwood, Cade, & Pearman, 2002; Sparks & Shepherd, 1994), consumer responses to food safety incidents (Pennings, Wansink & Meulenberg, 2002; Verbeke, 2001), and the perceived safety of different product groups (Berg et al., 2005; Verbeke & Viaene, 1999). In addition, previous research has addressed the issue of trust in information sources and institutions with responsibility for consumer protection (Frewer, Scholderer, & Bredahl, 2003; Lang & Hallman, 2005; Siegrist, Cvetkovich, Roth, 2000), media coverage of food risks (Frewer, Miles, & Marsh, 2002; Frewer, Raats, & Shepherd, 1993; Verbeke, Viaene, & Guiot, 1999), and socio-demographic correlates of food safety perceptions (Berg, 2004; Bouyer, Bagdassarian, Chaabanne, & Mullet, 2001; Miles et al., 2004; Williams & Hammitt, 2001). Although general consumer confidence in the safety of food has

not been investigated in previous research, the accumulation of food safety incidents may affect consumer confidence in the safety of food in general, beyond consumer concerns about the safety of specific hazards and product groups (Smith, Young, & Gibson, 1999). Therefore, in the present research a framework for the investigation of *general* consumer confidence in the safety of food in relation to its antecedents and behavioural consequences is developed and empirically tested.

The operationalisation of a framework for general consumer confidence in the safety of food has several theoretical and societal contributions. Identifying the determinants and consequences of general consumer confidence in the safety of food through the application of an integrative approach will produce enhanced insight into how general confidence arises and how it affects consumer behaviour. Insight into the antecedents of general consumer confidence in the safety of food can be used by, for example, risk managers and communicators to identify directives for their policy and activities towards optimising consumer protection associated with food safety issues. Understanding and quantifying the consequences of (reduced) general confidence in the safety of food is important for the assessment and anticipation of the behavioural and economic impact of changes in consumer confidence, and hence inform priority setting relating to food safety policies. In addition, by employing a longitudinal approach, the framework can serve as a monitoring instrument to be used for the investigation of causal relationships, and the impact of external events, such as food safety incidents and/or the introduction of policy measures, on consumer confidence, consumer behaviours, and consumer protection. In addition, monitoring consumer confidence in the safety of food provides stakeholders with a tool to keep themselves informed about consumer perceptions of food safety, which facilitates a pro-active approach to addressing consumer concerns.

1.1 Aim and scope of the thesis

Complementary to previous research, which has largely focused on consumer perceptions of specific food safety hazards and incidents, the aim of this research is to further conceptualise *general* consumer confidence in the safety of food, and to embed the concept within an integrative nomological framework that incorporates the antecedents and consequences of general consumer confidence in the safety of food.

In *Chapter 2*, the conceptual framework is developed. The construct of consumer confidence in the safety of food is defined and, on the basis of a review of the food safety literature as it relates to consumer perceptions and behaviours,

different determinants are identified, as well as behavioural consequences following from general consumer confidence in the safety of food.

As the concept of general consumer confidence in the safety of food has not been defined and operationalised in the existing literature, no reliable and valid operational measure is available for the construct. The aim of *Chapter 3* is, therefore, to develop a measure for general consumer confidence in the safety of food with good psychometric properties, which can then be further validated within the nomological network of the antecedents and consequences of general consumer confidence.

For the development of effective risk management and communication, it is important to understand which factors influence general consumer confidence in the safety of food. *Chapter 4* focuses on the determinants of the construct of general consumer confidence in the safety of food. The extent to which the proposed determinants of general consumer confidence in the safety of food uniquely contribute to explaining confidence, and which factors drive general confidence most, are investigated.

A longitudinal perspective on general consumer confidence in the safety of food, and its determinants, is established in *Chapter 5* in order to assess the robustness of the framework in terms of its measurement properties, as well as the temporal stability of consumer perceptions of food safety. Furthermore, actual coverage of food safety issues in the news media, which are an important source of information to consumers, is longitudinally compared against consumer recall of food safety incidents in order to examine to what extent consumer recall reflects day-to-day media coverage.

As food chains become increasingly globalised, some hazards have the potential to cross international boundaries. As a consequence, risk assessment, management, and communication are increasingly applied at an international level. This requires that the theoretical framework for consumer confidence in the safety of food is valid cross-culturally. In *Chapter 6*, the cross-national applicability of the framework is assessed, through a systematic approach comparing data from Canada and the Netherlands.

Consumer trust in actors in the food chain, such as food manufacturers, may represent an important determinant of general consumer confidence in the safety of food. If consumers trust others to ensure the safety of the food supply, this may enable consumers to compensate for their lack of knowledge about complex food production systems as they trust other food chain actors to maintain food safety standards on their behalf. In *Chapter 7* of this thesis, the relationship between trust in specific actors and general consumer confidence in the safety of food is

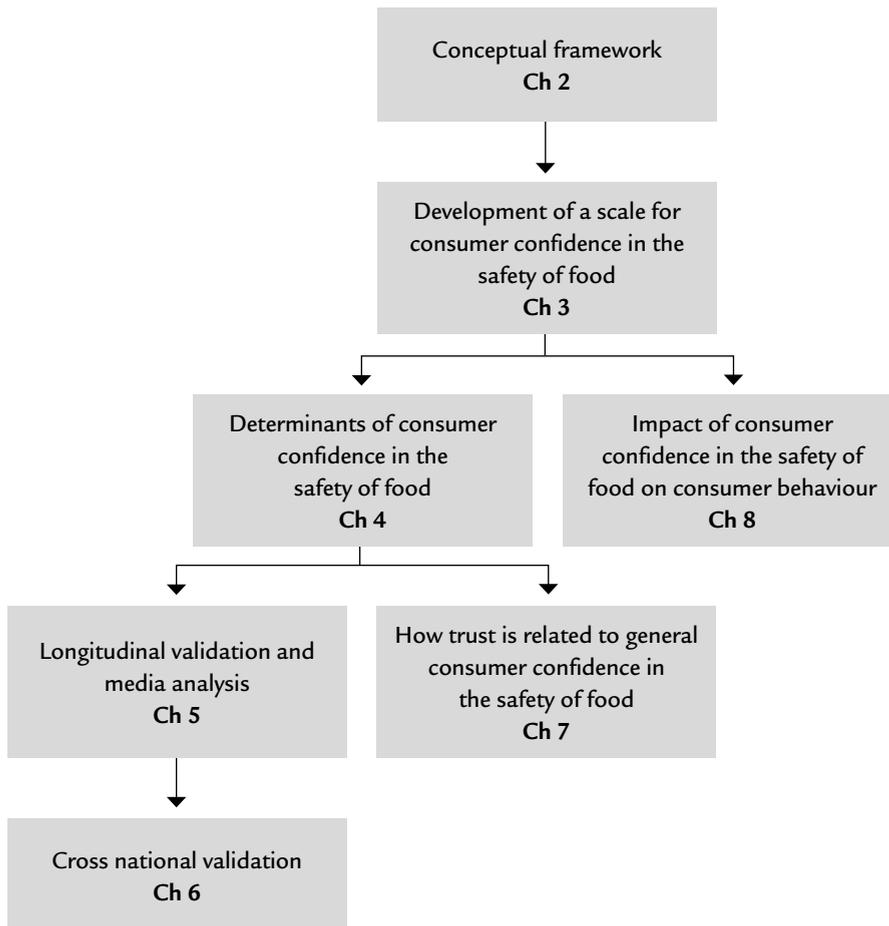


Figure 1.1 Outline of the thesis

investigated in depth. In particular, this relationship is disentangled such that the effects attributable to specific food chain actors can be identified, together with effects related to specific dimensions of trust, and effects of specific combinations between actors and different dimensions of trust.

The relationship between general consumer confidence in the safety of food and its behavioural consequences, that is, the predictive validity of the construct of consumer confidence, is the topic considered in *Chapter 8*. In this chapter, the extent to which consumers apply strategies to cope with uncertainty surrounding the safety of food is investigated. In particular, the extent to which consumers rely on external information or extrinsic product cues in order to reduce perceived risk

associated with food purchases is examined, together with the extent to which this depends on specific situational factors, and consumers' level of confidence in the safety of food in general.

Finally, in *Chapter 9*, the results and conclusions from the empirical studies are discussed. This chapter also addresses the theoretical and societal implications of the research, and discusses limitations of the research and opportunities for future research.

An overview of the structure of the thesis is provided in Figure 1.1.

2

A framework for consumer confidence in the safety of food

This chapter is partly based on the paper published as De Jonge, J., Frewer, L., Van Trijp, H., Renes, R. J., De Wit, W., & Timmers, J. (2004). Monitoring consumer confidence in food safety: An exploratory study. *British Food Journal*, 106 (10/11), 837-849.

Abstract

As a result of a number of food scares which have occurred in the food chain, food safety has become an important issue for regulators as well as the general public. The aim of this chapter is to develop a conceptual framework to identify the factors influencing consumer confidence in the safety of food and to determine the impact of changes in consumer confidence on consumer behaviour. Consumer confidence in the safety of food may be dependent upon consumer trust in actors in the food chain and institutions responsible for the management of hazards, consumer recall of food safety incidents and media coverage, the perceived safety of different product groups, and socio-demographic and personality characteristics. In the context of consumer behaviour, the level of consumer confidence in the safety of food may guide information search, as well as consumption choices with respect to brand, quality label, price, and retail channel.

2.1 Introduction

Scholars generally agree that, besides expert risk assessment, it is important to understand lay perceptions of risks in order to develop effective risk management practices (Frewer, 2001; Hansen, Holm, Frewer, Robinson, & Sandøe, 2003; Slovic, 1987). Results from several studies indicate that a discrepancy exists between expert and lay perceptions of risk (Baron, Hershey, & Kunreuther, 2000; Sjöberg, 2001; Slovic, 1987). Expert and non-expert risk perceptions may differ as a consequence of differences in knowledge about risks, the degree of exposure to particular risks, or the type of information source used (Baron et al., 2000). Furthermore, whereas risk assessors may base their assessments of risk primarily on the combination of probabilities and outcomes (increasingly taking into account risk variability and uncertainty, see Thompson, 2002), the public incorporate factors such as fear, controllability, worry, and risk to future generations (Loewenstein, Weber, Hsee, & Welch, 2001; Slovic, 1987). In addition, public concerns include environmental issues and animal welfare aspects (Miles & Frewer, 2001).

In previous research on consumer perceptions of food safety and food-related risk, the focus has largely been on specific hazards (see, Frewer, Shepherd & Sparks, 1994; Miles & Frewer, 2001; Pennings et al., 2002; Bredahl, 2001), and specific product groups (McCarthy & Henson, 2005; Pennings et al., 2002; Verbeke, 2001). However, successive food safety incidents can have long term consequences for general consumer confidence in the safety of food (Smith et al., 1999), beyond effects pertaining to particular product groups. That is, the accumulation of incidents might put pressure on consumer confidence in the safety of food *in general*. Therefore, it is important to understand the concept of general consumer confidence in the safety of food, as well as its determinants and consequences. Insight into general consumer confidence in the safety of food is not only important in order to obtain an in depth understanding of consumer perceptions and behaviours with respect to food safety, but also has important practical implications for effective risk communication. That is, increased insight into general consumer confidence in the safety of food and how this comes about might help risk communicators to identify the factors underlying consumer concerns, and better address these in risk communication efforts. In addition, insights may be applied to assess, indirectly, the effectiveness of risk management and communication practices aimed at improving food safety and protecting the public. This requires that consumer confidence in the safety of food is measured on multiple occasions, providing 'base level' measurements against which changes in consumer perceptions can be captured.

A conceptual framework for general consumer confidence in the safety of food has not been identified in previous research. Therefore, the aim of the current chapter is to develop such a framework, which will be empirically tested and validated in the subsequent chapters. The framework includes both antecedents and consequences of the core construct of general consumer confidence in the safety of food. After discussing the key construct, four groups of antecedents of consumer confidence in the safety of food (consumer trust in actors in the food chain and institutions responsible for the management of hazards, consumer recall of food safety incidents and media coverage, the perceived safety of different product groups, and socio-demographic and personality characteristics) are identified, together with two types of consequences (information search, and consumption choices with respect to brand, quality labels, price, and retail channel).

2.2 Consumer confidence in the safety of food

The core construct of the conceptual framework is the concept of general consumer confidence in the safety of food. In previous research, general confidence has been defined as “the belief that most future events will occur as expected” (Siegrist, Earle, & Gutscher, 2003). Confidence judgments are relevant for many issues in life (Siegrist et al., 2003). For example, it has been shown that people can have confidence in future economic developments (Katona, 1974), in personal abilities (Brug, Lechner, & De Vries, 1995), and (as we propose) in the safety of food.

In previous research, consumer perceptions about the safety of food in general have not received much attention; most studies investigated the perceived safety or risk of specific product groups (Berg et al., 2005; Verbeke, 2001), or food-related hazards (Bredahl, 2001; Miles & Frewer, 2001; Sparks & Shepherd, 1994). In previous research where consumer perceptions about the safety of food in general have been assessed, this was done on the basis of single-item measures, such as “I am confident that food in the shops is safe” (Henson & Northen, 2000), “How concerned are you about food and its safety in your daily life?” (Miles et al., 2004), and “Food products have never been as safe as nowadays” (De Jonge et al., 2004). Although these measures might provide some exploratory insight into consumer perceptions of the safety of food in general, multi-item measures are generally characterised by higher measurement reliability and validity (Churchill, 1979).

In the context of food safety, confidence indicates the implicit belief that the consumption of food products will not result in adverse health effects, as this is what the average consumer would normally expect to happen. That is, confidence is based on familiarity (Siegrist et al., 2003), and develops from the accumulation

of positive experiences. When established expectations are disappointed, for example after the occurrence of a food safety incident, the level of consumer confidence might be adjusted downwards (Kjærnes, 2006). In this thesis, general consumer confidence in the safety of food is defined as the degree to which consumers perceive that food is generally safe (and does not cause any harm to their health or to the environment).

2.3 Determinants of general consumer confidence in the safety of food

Various factors may underpin general consumer confidence in the safety of food. Four determinants are identified as core antecedents of consumer confidence: trust in regulators and actors in the food chain, consumer recall of food safety incidents and media coverage, the safety of product groups, and individual differences.

2.3.1 Trust in regulators and actors in the food chain

As a result of the complexity of the food production system, and because consumers cannot always judge the safety of food themselves during the course of normal consumption (Green et al., 2003; Grunert, 2002), consumers have to rely on actors in the food chain to provide safe food. Green, Draper and Dowler (2003) found that consumers use their trust in salespersons, especially the ones they personally know, and regulatory institutions as a strategy to assess perceptions of safety. This indicates that consumers compensate for the lack of knowledge about the food they eat by conferring trust to actors in the food chain and regulating authorities (Berg, 2004; Siegrist & Cvetkovich, 2000; Van Kleef et al., 2006). It has been suggested that consumer trust in producers and distributors responsible for the management of hazards may be an important driver of general consumer confidence in the safety of food (Berg et al., 2005; Brunel & Pichon, 2004; Grunert, 2002).

The concept and the dimensions of trust have been examined in different fields of research (economics, sociology, psychology, mass communication), and the interested reader is referred to reviews of this literature (see, for example, Hansen et al., 2003; Johnson, 1999; Kasperson, Golding, & Tuler, 1992; Poortinga & Pidgeon 2003; Renn & Levine, 1991; Rousseau, Sitkin, Burt, & Camerer, 1998; Swan, Bowers, & Richardson, 1999). Two important characteristics of trust are an individual's willingness to accept personal vulnerability (Rousseau et al., 1998), and to rely upon others (Cvetkovich, Siegrist, Murray, & Tragesser, 2002; Kasperson et

al., 1992; Siegrist et al., 2000). Conferring trust to a particular entity allows people to take things for granted (Creed & Miles, 1996), and to behave according to habits or routines (Johnson & Auh, 1998). A clear definition of trust has been provided by Siegrist et al. (2000). They defined social trust as “the willingness to rely on those who have the responsibility for making decisions and taking actions related to the management of technology, the environment, medicine, or other realms of public health and safety” (p. 354). Perceptions of expertise, honesty, and benevolence are regarded as underlying dimensions of trust (Johnson, 1999). However, some researchers claim that judgments of trust are based on perceived value similarity and individual’s agreement with policy decisions rather than on perceptions of institutional competence and responsibility (Earle, 2004; Earle & Cvetkovich, 1999; Siegrist et al., 2000).

Consumer confidence in the safety of food may result from consumer trust in institutions responsible for the management of hazards, producers and distributors (Berg et al., 2005; Brunel & Pichon, 2004; Grunert, 2002). Consumer beliefs that the functioning of the food production system can be relied upon, and that appropriate actions will be taken to prevent harm to public health when an incident occurs, might be of major importance for general consumer confidence in the safety of food (Grunert, 2002). However, although the responsibility of food safety is shared between different actors (Bergeaud-Blackler & Ferretti, 2006), consumer trust in some actors may have a greater impact on general consumer confidence in the safety of food than consumer trust in other actors. Furthermore, different dimensions of trust may differentially contribute to the enhancement of general consumer confidence in the safety of food (see Van Kleef et al., 2007).

2.3.2 Consumer recall of food safety incidents and media coverage

The news media are an important vehicle of food safety information (Lofstedt, 2006), and can play an important role in building and undermining consumer confidence in the safety of food (Verbeke et al., 1999). Over the past years, media attention to food safety issues has been considerable (Frewer et al., 1993), and longitudinal studies have shown a relationship between dissemination of risk information through the media and changing consumer perceptions and behaviours (Fleming, Thorson, & Zhang, 2006; Frewer et al., 2002; Liu, Huang, & Brown, 1998; Verbeke, 2001). For example, Verbeke (2001) reported that the Belgian dioxin contamination in animal feed in 1999, which caused considerable reporting on associated public health risks, presumably caused consumer attitudes toward poultry and pork to become less favourable compared to previous assess-

ments (see Verbeke & Viaene, 1999). Conversely, beef, which was not affected by the dioxin scare, was judged more positively, potentially as a result of advertising activities to re-establish the image of beef after the hormone and BSE crises of the second half of the nineteen nineties (Verbeke, 2001). It must be noted, however, that aggregate national consumption levels of poultry, pork, and beef did not reflect the shifts observed in consumer attitudes (Verbeke, 2001).

Other empirical studies found that food related risk information in the media resulted in large and immediate negative effects, whereas recovery was a much slower process (Frewer et al., 2002; Liu et al., 1998). For example, Frewer et al. (2002) report, that during high levels of media communication about genetically modified food, consumer risk perceptions associated with the technology increased and consumer benefit perceptions decreased. When media coverage of genetic modification of food subsequently diminished, risk perception dropped to the level prior to increased media attention. However, perceived benefits with regard to genetically modified food remained depressed (Frewer et al., 2002). Besides influencing risk and benefit perceptions, media coverage of food risks has been reported to affect consumption levels. Liu et al. (1998) examined the impact of news messages regarding milk contamination on changes in the consumption level of milk. It was found that consumption dropped instantly after negative information was provided, whereas positive information only slowly influenced sales recovery. Although recovery was slow, dissemination of positive information did reduce losses, indicating the importance of providing positive information when the incident has been successfully managed.

The differential effect of positive versus negative messages on resultant consumer risk perceptions and attitudes has been examined in several studies (Poortinga & Pidgeon, 2004; Siegrist & Cvetkovich, 2001; Slovic, 1993, 1999; White & Eiser, 2005). Negative events receive more attention compared to positive events (Slovic, 1993), and have a greater impact on attitudes compared to positive events (Poortinga & Pidgeon, 2004; Slovic, 1993; White & Eiser, 2005). That is, the unusual and exceptional event of a food safety incident will have a stronger impact on consumer concerns and risk perceptions, than the absence of such an event in previous months will have on creating or maintaining confidence in the safety of food. However, research has indicated that the differential impact of positive and negative events on trust is dependent upon the type of the hazard (White & Eiser, 2005), as well as consumers' prior attitudes (Poortinga & Pidgeon, 2004). Thirdly, people perceive sources of bad news as being more credible than sources of good news (Siegrist & Cvetkovich, 2001; Slovic, 1993). These tendencies may lead to a

bias of consumer concerns and risk perceptions towards negativity¹, which may put consumer confidence under pressure.

In examining the extent to which general consumer confidence in the safety of food is influenced by food safety incidents and media coverage of food risks, it is important to distinguish between *actual* incidents and media coverage on the one hand, and *recalled* incidents and media coverage on the other. For food safety incidents and media coverage to influence general consumer confidence in the safety of food, consumers must process and recall the provided information. Consumers pay attention to (food safety) information selectively (Kahneman, 1973), because they are not aware of or interested in all information, and some information, for example information that is evaluated as being personally relevant, will have a larger impact (Eagly & Chaiken, 1993; Kasperson, 1992). Consumer recall of information might therefore not exactly mirror media coverage of food risks. The impact of food safety incidents and media coverage on general feelings of confidence is likely to be influenced by their availability, which refers to the ease with which one can bring to mind examples of an event (Tversky & Kahneman, 1973, 1982). Several factors may contribute to the extent to which consumers recall food safety incidents and associated media attention.

Firstly, public risk perceptions can be intensified (and attenuated) by social processes, as described by the social amplification of risk model (Kasperson et al., 1988; Renn, 1991). A large amount of risk information may serve as a risk amplifier, independent of the accuracy and actual content of the information (Beardsworth & Keil, 1997: p. 164-165). In addition, disagreement between various actors in the risk debate, dramatisation of risk information, and framing of the message can facilitate amplification of risk (Kasperson et al., 1988). However, it has been argued that whether amplification occurs also depends on other factors, such as the level of knowledge held by the public and public trust in regulators (Frewer et al., 2002). In addition, exposure to news messages may only influence perceived risk for individuals who judge the information source to be useful in providing particular risk information (Morton & Duck, 2001). Finally, when prior attitudes regarding a food safety issue are strong, news messages may have a reduced effect on influencing attitudes (Frewer et al., 2003; White, Pahl, Buehner, & Haye, 2003).

Secondly, the availability of food safety issues in the mind of the consumer might be dependent upon the type of hazard. That is, food safety hazards that are

1 These tendencies are also described by Slovic (1993) in the context of the asymmetry principle, that is, the tendency that trust is easier to destroy than to create. In this study we refer to these tendencies in a somewhat broader context, namely consumer confidence in the safety of food and consumer risk perceptions.

unknown and dreaded by consumers, such as public health risks associated with genetically modified foods or pesticide residues, might probably be better recalled by consumer compared to known and not much dreaded hazards, such as high fat diets (Kirk et al., 2002; Sparks & Shepherd, 1994).

Thirdly, food hazards might be better recalled when vivid images of a particular incident can be evoked (Loewenstein et al., 2001), for example images of the large-scale destruction of birds in relation to Avian Influenza.

In conclusion, it might be expected that consumers who recall food safety incidents that have occurred during recent years, or who are aware of particular food-related risks, are less confident about the safety of food in general, compared to consumers to whom food safety hazards or food-related risks are not salient.

2.3.3 Safety perceptions of product groups

Closely related to consumer confidence in the safety of food in general is consumer confidence in the safety of particular product groups. As food scares typically do not involve the entire food production system and always pertain to potential risks associated with one or several particular product groups (e.g., beef), consumer safety perceptions of particular product groups should be taken into account when examining developments in general consumer confidence in the safety of food. Several studies have examined to what extent various product groups were perceived by consumers to be risky or unsafe (e.g., Berg et al., 2005; De Jonge et al., 2004; Poppe & Kjærnes, 2003; Verbeke, 2001). In one of these studies it was assumed that general consumer confidence in the safety of food could be represented by the average of consumer perceptions of different product groups (Berg et al., 2005). However, Poppe & Kjærnes (2003) indicated that this relationship may be less straightforward; although the perceived safety of different product groups and general consumer pessimism about the safety of food were significantly related, only a moderate part of the variance was explained. Therefore, the perceived safety of different product groups is considered to be distinct from general consumer confidence in the safety of food, although it might be expected that the perceived safety of product groups is positively related to consumers' general confidence in the safety of food.

2.3.4 Individual differences

Socio-demographic variables have been taken into account in previous research that examined individual differences in risk perceptions and food safety concerns

(Berg, 2004; Bouyer et al., 2001; De Jonge et al., 2004; Dosman, Adamowicz, & Hrudefy, 2001; Kirk et al., 2002; Miles et al., 2004; Parry, Miles, Tridente, Palmer, & South and East Wales Infectious Disease Group, 2004; Williams & Hammitt, 2001). With regard to general perceptions of food safety, it has been reported that women tend to be less confident about the safety of food in general when compared to men (Berg, 2004; De Jonge et al., 2004; Miles et al., 2004). In addition, women's risk perceptions of different kinds of hazards, including food hazards, were higher in comparison with men's risk perceptions (Bouyer et al., 2001; Dosman et al., 2001; Kirk et al., 2002). In particular, white males' risk perception ratings were consistently much lower compared to risk perceptions of white females and people of colour (Flynn, Slovic, & Mertz, 1994). Further research on gender and race differences in risk perceptions indicated that socio-political factors, such as predominant worldviews, accounted in part for the observed differences (Finucane, Slovic, Mertz, Flynn, & Satterfield, 2000; Flynn et al., 1994; Palmer, 2003). Although several studies indicated that young people perceive risks to be lower in comparison with elderly people (Dosman et al., 2001; Miles et al., 2004), this relationship was often not univocal (Bouyer et al., 2001; De Jonge et al., 2004; Kirk et al., 2002; Williams & Hammitt, 2001). Other socio-demographic variables that have been examined, such as income, education level, and number of children in the household, were often found to be unrelated to risk perceptions and concerns (Dosman et al., 2001; Williams & Hammitt, 2001; Miles et al., 2004).

In addition to socio-demographic variables, several studies have investigated how personality characteristics are related to consumer perceptions of risk and concern about food safety (Sparks & Shepherd, 1994; Verbeke & van Kenhove, 2002). A personality characteristic of particular relevance in the context of food safety is the extent to which consumers have a tendency to worry excessively in general, which is referred to as *trait worry* (Gebhardt & Brosschot, 2002; Meyer, Miller, Metzger, & Borkovec, 1990). Previous research has indicated that people who are, generally, more prone to worry and stress, also respond to food safety incidents more negatively than those who are low in this trait (see Verbeke & Van Kenhove, 2002).

Consumer confidence in the safety of food may also depend on individuals' perceived personal control over food risks. In fact, perceived personal control appeared to be one of the most important justifications for not worrying about potential hazards (Baron et al., 2000). In previous research, perceived personal control was found to be negatively related to perceived personal risk from food-related hazards (Sparks & Shepherd, 1994; however, see Frewer et al., 1994), and has been associated with a lower estimated probability of experiencing negative

life events (Darvill & Johnson, 1991; Weinstein, 1980). It might be expected that consumers who perceive that they themselves are able to control food risks will show a higher confidence in the safety of food.

2.3.5 Summary

In this section we have outlined that general consumer confidence in the safety of food may be influenced by consumer trust in actors in the food chain and institutions responsible for food risk management, consumer recall of food safety incidents and media coverage of food risks, the perceived safety of product groups, and individual differences. The determinants of consumer confidence in the safety of food which have been identified may not be independent of one another. For example, increased media attention to food safety issues might affect consumer trust in regulators and actors in the food chain, when consumers perceive that that regulations apparently fall short of delivering adequate consumer protection, or are not adopted by all actors in the food chain. However, the primary interest of this research is the concept of general consumer confidence in the safety of food, and how this may be influenced by the different factors, the interrelationships between the determinants of general confidence are not further discussed here.

2.4 The consequences of consumer confidence on consumer behaviour

Being worried or scared is generally an uncomfortable mental state for any individual. As a consequence, when consumer confidence in the safety of food is reduced, consumers will be motivated to engage in behaviours to cope with their concerns (Baron et al., 2000; Brunel & Pichon, 2004; Griffin, Dunwoody, & Neuwirth, 1999), at least when an individual's risk tolerance level is exceeded (Mitchell, 1998). Such coping strategies include *risk avoidance* (Duhachek, 2005; Roselius, 1971), and *risk reduction* by relying on risk relievers (Derbaix, 1983; Roselius, 1971).

Risk avoidance behaviour, which is characterised by stopping or reducing consumption of a particular product, is particularly relevant in the context of a food safety incident, such as BSE (Burton & Young, 1996; Pennings et al., 2002; Piggott & Marsh, 2004; Setbon, Raude, Fischler, & Flahault, 2005; Verbeke, 2001; Verbeke, Ward, & Viaene, 2000). Risk avoidance behaviour in response to a food safety incident is often temporary (Piggott & Marsh, 2004). Risk avoidance behaviour by ceasing to consume, or reducing consumption, is only possible when

substitute products are available to replace the avoided products. That is, consumption of food can not be avoided altogether.

An alternative strategy to risk avoidance is risk reduction by relying on risk relievers, which can be defined as information that increases the perceived likelihood of good product performance (see, McCarthy & Henson, 2005). Reliance on risk relievers is a matter of consuming *differently* (i.e., a qualitative change in food consumption), rather than *ceasing* or *decreasing* consumption (i.e., a quantitative change in food consumption). Reliance on risk relievers might be relevant when a food safety incident occurs, as well as in a normal purchase situation. Information from external sources, as well as product features can function as risk relievers. By relying on cues from information or product features, consumers can form beliefs about the safety of food products. These belief formation processes are referred to, respectively, as informational and inferential belief formation (Fishbein & Ajzen, 1975). Beliefs that are formed on the basis of external information (i.e., informational belief formation) from sources such as the manufacturer of the product, a food safety authority, or the news media, may function as risk relievers in the sense that this information might assist consumers in making an informed purchase decision, and relief concerns (Shimp & Bearden, 1982). Research has shown that when confronted with a risky situation, consumers particularly want to know what the risk means, how one is exposed to the risk, what the consequences are, and whether the risk is controllable (Lion, Meertens, & Bot, 2002). Inferential belief formation refers to the process where consumers use cues for which descriptive beliefs are formed (i.e., beliefs that result from direct observation), from which to infer beliefs about credence attributes, such as safety (Steenkamp, 1990). Although intrinsic product cues (e.g., product appearance) can also serve this function, often these cues are based on extrinsic product features that are not directly related to the intrinsic product, such as brand, quality labels, price, and purchase location (McCarthy & Henson, 2005; Roselius, 1971; Verbeke & Vackier, 2004).

Previous research has indicated that the type of brand is often seen as indicative of the level of perceived risk (Mieres, Martín, & Gutiérrez, 2006), and that private label purchase was lower when product categories were perceived to be risky (Sinha & Batra, 1999). It has been argued that relying on well-known brands was one of the most important risk reducing strategies for consumers (Mitchell & Boustani, 1994). Consumers with a low level of confidence in the safety of food might therefore be more inclined to buy branded products. Quality labels can also be used by consumers to infer safety from (Henson & Northen, 2000), and were one of the key extrinsic product features used by consumers as risk relievers (McCarthy & Henson, 2005). Further, when perceived risk is high, consumers

might be more likely to rely on a product's price as an indicator of its quality (Shapiro, 1973), where a higher price is associated with increased quality, and hence lower risk. Finally, purchase location may function as a cue to infer safety beliefs from (Derbaix, 1983; McCarthy & Henson, 2005; Mitchell & Harris, 2005; Verbeke & Vackier, 2004). For example, consumers who perceived meat choice to be risky, had a higher preference to buy fresh meat at the butcher in stead of the supermarket (Verbeke & Vackier, 2004).

2.5 A conceptual framework for consumer confidence in the safety of food

This chapter has provided an overview of the literature on consumer perceptions of food safety and food-related hazards, and presented the building blocks of the conceptual framework of consumer confidence in the safety of food, which is displayed in Figure 2.1. The conceptual framework identifies the key determinants and behavioural consequences of general consumer confidence in the safety of food, which is the core construct of the framework. Enhanced insight into the factors that influence general consumer confidence in the safety of food, and how

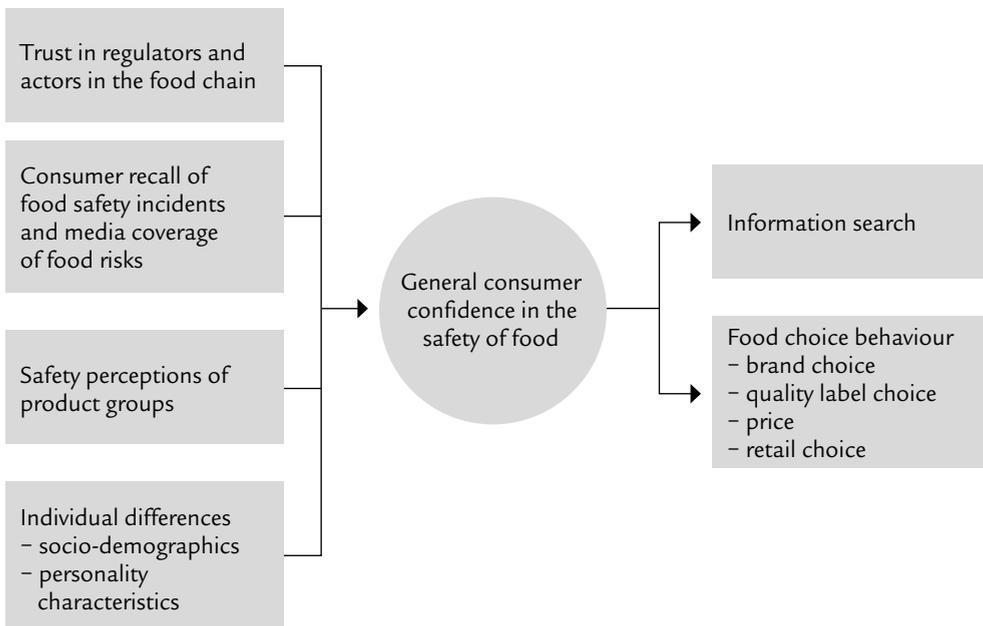


Figure 2.1 A framework for consumer confidence in the safety of food

general confidence influences behaviour, may provide risk communicators with information to more effectively communicate about food risks to the public. In addition, insight into how general consumer confidence in the safety of food develops over time, provides insight into the temporal stability of the framework, as well as consumer responses to external events, such as food safety incidents and efforts by food safety authorities and regulators to improve food safety, and clearly communicate to the public. In the next chapters of the thesis, the framework will be operationalised, and empirically tested.



3

A scale for consumer confidence in the safety of food

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Abstract

The aim of this study was to develop and validate a scale to measure general consumer confidence in the safety of food. Results from exploratory and confirmatory analyses indicate that general consumer confidence in the safety of food consists of two distinct dimensions, optimism and pessimism, which can co-exist. Since optimism and pessimism may not be activated by the same events, or at the same time, these dimensions should be assessed and evaluated separately, in order to increase understanding of consumer confidence in the safety of food, and to develop effective food risk communication.

3.1 Introduction

In response to a number of food safety scares over the past decades, food safety issues have become increasingly important within society. In order to better protect consumers, a range of new regulations have been developed and implemented (see O'Rourke, 2001). For example, food producers are obliged to incorporate quality management systems (such as Hazard Analysis Critical Control Points) into the food production process. Also, tracking and tracing systems have been introduced to be able to efficiently trace the origin of contaminated, or otherwise harmful food products or ingredients. One of the key challenges of regulatory institutions is to strengthen consumer confidence in the safety of food (Houghton, Van Kleef, Rowe, & Frewer, 2006; Regulation (EC) 178/2002), as it has been recognised that failure to incorporate public perceptions into policy development has had extremely negative effects on public confidence in the past (Frewer & Salter, 2002).

Despite the increased interest into the concept of consumer confidence in the safety of food, it has to our knowledge not been adequately defined and operationalised in the existing literature. In previous research, the extent to which consumers are confident about the safety of food in general has been assessed using single-item measures (De Jonge et al., 2004; Henson & Northen, 2000; Miles et al., 2004), which do not allow for a critical test of the reliability and validity of the measure (Churchill, 1979). Therefore, following psychometric best practice (see, for example, Baumgartner & Homburg, 1996; Churchill, 1979; Steenkamp & Van Trijp, 1991), the aim of this study is to develop a reliable and valid measure of general consumer confidence in the safety of food.

3.2 Scale development

First, the concept of general consumer confidence is defined. Then item generation and purification are discussed. In a confirmatory assessment, the convergent and discriminant validity of the scale are investigated, and in the last step the scale of consumer confidence is cross validated in another sample.

3.2.1 Conceptual definition

Judgments of confidence have relevance for many areas of life (Siegrist et al., 2003). For example, people can have confidence in future economic developments (Katona, 1974), personal abilities (Brug, Lechner, & De Vries, 1995), and (as we

propose) in the safety of food. Confidence can be regarded as a taken-for-granted attitude towards particular aspects of daily life (see, for example, Berg et al., 2005; Hansen et al., 2003). Confidence is based on familiarity, and may be reduced or lost when a consumer's automatic expectations are disappointed (Kjærnes & Dulsrud, 1998, as cited in Hansen et al., 2003). Although several studies have examined consumer confidence in the safety of food, their main focus was not on developing a measure for it. Previous research has focused on specific food-related hazards and issues of concern (e.g., Miles & Frewer, 2001; Setbon et al., 2005; Verbeke, 2001), how different hazards are perceived by consumers in terms of various risk characteristics, such as the extent to which hazards are known and dreaded (e.g., Fife-Schaw & Rowe, 1996; Fischhoff et al., 1978; Kirk et al., 2002; Sparks & Shepherd, 1994), and how food safety incidents influence consumer risk perceptions and purchase intentions with respect to particular foods (e.g., Pennings et al., 2002). However, successive food scares, as well as more general consumer concerns about contemporary food production practices, might have long term consequences for consumer confidence in the safety of food *in general*, besides effects associated with particular product groups (Smith et al., 1999). The accumulation of incidents, no matter how different in character and in terms of risk for public health, might put pressure on consumer confidence in food safety in general. In this study, general consumer confidence in the safety of food is defined as the extent to which consumers perceive that food is generally safe, and does not cause any harm to their health or to the environment.

3.2.2 Item generation and purification

Based on a review of the literature, a set of 26 items designed to measure general consumer confidence in the safety of food was constructed. Some items were developed and adapted from previous research on consumer perceptions of food safety (De Jonge et al., 2004; Henson & Northen, 2000; Miles et al., 2004; Sapp & Bird, 2003). In addition, based on several studies conducted on emotions, or affective factors, in relation to consumption (Chaudhuri, 1998), various emotions (both positive and negative) were selected taking into account their applicability in the context of food safety (Laros & Steenkamp, 2004, 2005).

In a pilot study, the 26 items were tested in order to select a subset for measuring general consumer confidence in the safety of food. Data were collected by a professional market research agency in September 2003 from 106 Dutch respondents. Half of the respondents were male and half of the respondents were female. The respondents' age ranged between 18 and 60, and different levels of education

were represented. The items were rated on 5-point likert scales ranging from 'disagree strongly' (1) to 'agree strongly' (5), and are shown in Table 3.1. Three respondents (3%), who answered 3 or more of the 26 items (i.e., > 10%) with 'don't know', were not included in the analysis. The remaining cases contained few missing values, and data from these respondents were included in the analysis.

To examine the interrelationships between the items and the dimensional structure underlying them, principal components analysis with varimax rotation was performed in SPSS 12.0.1 (see Table 3.1). The underlying structure of the data was represented by two components, which together explained 51.1% of the variance. The two components reflected a split between positive (optimism) and negative (pessimism) beliefs about the safety of food. Five items that had communalities < 0.40 were not included in the scale. In addition, four items that extremely departed from a symmetric distribution, i.e., where the most observed answer (between 31 and 46 percent of the responses) was one extreme of the scale, were excluded from further analysis. Two items, of which one generated relatively many missing values (i.e., 'don't know' answers) and the other was too broadly defined, were excluded as well. When two items were highly similar, e.g. 'I do not have faith in the safety of food' and 'I am confident that food products are safe', one of the items was removed. Eventually, 12 items were selected for the final scale, 6 to measure 'optimism' and 6 to measure 'pessimism' (see Table 3.1). The reliability of the subscales and the internal consistency of the items was high ($\alpha > 0.86$ for both 'optimism' and 'pessimism').

3.2.3 Assessing convergent and discriminant validity

To formally test the dimensional structure of the two scales, as well as their discriminant and convergent validity, confirmatory factor analysis was applied to a larger sample.

Data collection and sample

Surveys were administered in November and December 2003, and in total 525 respondents filled out the survey. Data were collected by a professional market research agency (GfK Panelsevices Benelux B.V.), with geographical sampling by region throughout the Netherlands. The sample consisted of persons of a 'household' panel ($n = 200$), i.e. people who were responsible for the daily shopping for their household, and persons from an 'individuals' panel ($n = 325$), i.e. people who did not have the responsibility for the daily grocery shopping. The survey consisted

Table 3.1 Means, standard deviations, communalities, and rotated factor loadings for the consumer confidence in the safety of food items

Statements	M (SD)	Communi- nality	Rotated factor loadings	
			Pessimism (VAF=42%)	Optimism (VAF=9%)
Food products have never been as safe as nowadays ^a	3.14 (1.14)	0.351	-0.071	0.588
I believe food products are becoming increasingly safe^f	3.49 (1.11)	0.673	-0.102	0.814
Food scares increase my concern about food safety^f	2.58 (1.29)	0.669	0.814	-0.072
In recent months my confidence in food products has decreased^f	2.18 (1.06)	0.678	0.663	-0.489
Generally there are few risks involved with food^f	3.43 (1.05)	0.503	-0.240	0.667
Too often it happens that food products are sold in the Netherlands that are dangerous to consumed	2.52 (1.16)	0.552	0.701	-0.247
I worry about the safety of food	2.72 (1.20)	0.568	0.688	-0.308
I do not have faith in the safety of food ^c	2.33 (1.14)	0.512	0.575	-0.426
I am afraid to become ill as a consequence of the products I eat ^a	2.05 (1.00)	0.259	0.354	-0.366
I am confident that food products are safe	3.87 (1.02)	0.519	-0.490	0.528
I get very stressed when I think about food safety ^b	1.96 (0.98)	0.415	0.513	-0.390
I think the quality of food will increase ^e	3.61 (1.04)	0.629	-0.070	0.790
I feel uncomfortable regarding the safety of food	2.35 (1.15)	0.65	0.788	-0.170
Generally food products are safe	3.83 (0.89)	0.554	-0.334	0.666
As a result of the occurrence of food safety incidents I am suspicious about certain food products	2.90 (1.29)	0.498	0.678	-0.195
I feel frustrated about the problems that come up in the area of the safety of food ^b	2.47 (1.31)	0.569	0.715	-0.240
I believe few risks are involved in the consumption of food products ^c	3.33 (1.12)	0.443	-0.258	0.613
It scares me that there are problems with managing the safety of food^f	2.90 (1.22)	0.588	0.745	-0.183

Table 3.1 Means, standard deviations, communalities, and rotated factor loadings for the consumer confidence in the safety of food items (continued)

Statements	M (SD)	Communi- nality	Rotated factor loadings	
			Pessimism (VAF=42%)	Optimism (VAF=9%)
I am calm about all discussions about the safety of food ^a	3.75 (1.12)	0.345	-0.414	0.417
Problems that occur in the area of food safety make me angry ^a	3.11 (1.24)	0.249	0.485	-0.119
I feel hopeful about the developments in the area of food safety ^c	3.51 (1.06)	0.486	-0.145	0.682
I feel nervous when I think about the safety of food products ^b	2.00 (1.03)	0.563	0.661	-0.356
I am optimistic about the safety of food products	3.51 (1.01)	0.671	-0.365	0.733
I panic as a result of food safety incidents that occur ^b	1.89 (1.01)	0.468	0.683	-0.048
I feel helpless as a consumer, with regard to the safety of food ^a	3.03 (1.34)	0.305	0.490	-0.256
I am satisfied with the safety of food products	3.38 (1.12)	0.562	-0.424	0.618

Note: Statements in bold indicate that the item has been selected for the confirmatory test of the subscales.

^a Excluded on the basis of low communality (< 0.40)

^b Excluded on the basis of asymmetric distribution

^c Excluded on the basis of overlap in content

^d Excluded on the basis of a high number of 'don't know' answers

^e Excluded on the basis of a too broad item content

^f Excluded on the basis of Confirmatory Factor Analysis

of the 12 items about general consumer confidence in the safety of food that were selected from the pilot study (see Table 3.1), next to other items dealing with consumer perceptions of the safety of food. Answers to the 12 items were rated on 5-point likert scales ranging from 'disagree strongly' (1) to 'agree strongly' (5).

Respondents with missing values on the 12 items measuring consumer confidence in the safety of food were excluded from the analysis, leaving 458 observations suitable for analysis (87%). The remaining sample was compared with official population statistics on gender and age, and found to be representative for the Dutch population for these characteristics.

Data analysis

Confirmatory factor analysis in LISREL 8.50 was used to assess the validity of the scale of general consumer confidence in the safety of food. Maximum likelihood was used for estimation. Assessment of model fit was based on the Satorra-Bentler (S.-B.) scaled χ^2 statistic² and conventional fit statistics, such as the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), and the Non-Normed Fit Index (NNFI), see Schermelleh-Engel, Moosbrugger, and Müller (2003) for the interpretation of these statistics. For convergent validity to be confirmed, the Average Variance Extracted (AVE) should exceed 0.50 for each subscale (Fornell & Larcker, 1981). For discriminant validity to be confirmed, the AVE for each subscale should exceed the squared correlation between the two subscales (Fornell & Larcker, 1981), and the correlation between the two subscales should be significantly smaller than 1 (Anderson & Gerbing, 1988).

Results

The two-dimensional structure underlying the 12 items fits the data well in terms of fit statistics (Table 3.2, Model 1). The RMSEA is below 0.05, and the CFI and NNFI are larger than 0.90. However, for three items the variance accounted for (VAF) is (far) below the minimum level of 50%. Therefore, in the first modification step, these items are removed from the scale. Two items deal with consumer perceptions of the safety of food over time (i.e., 'I believe food products are becoming increasingly safe', VAF = 0.43, and 'In recent months my confidence in food products has decreased', VAF = 0.29). The poor performance of these items on the confidence scale indicates that the extent to which consumers perceive that food is becoming increasingly safe does not necessarily indicate that they perceive it is safe. The third item that does not fit to the scale is 'Generally there are few risks involved with food', VAF = 0.34. The level of perceived risk associated with food and the extent to which consumers are optimistic or pessimistic about the safety of food appear to be two different things (also, see Sjöberg, 1998). General consumer confidence in the safety of food may not be based on a cognitive judgment of the perceived riskiness of food, but may rather be represented by general emotions or feelings (see also Loewenstein et al., 2001; Slovic, Finucane, Peters, & MacGregor, 2004). The fit statistics of the adjusted model (Model 2) are shown in Table 3.2.

2 A check of the multivariate normality of the data indicated that the data departed from normality. Hence we applied a Satorra Bentler (S.-B.) χ^2 correction to account for this (see, Chou & Bentler, 1995).

Table 3.2 Model fit statistics

	χ^2	S.-B. scaled χ^2	df	RMSEA	CFI	NNFI
Model 1	205.7	47.2	53	0.00	0.94	0.93
Model 2	94.3	21.5	26	0.00	0.97	0.95
Model 3	47.6	8.8	13	0.00	0.98	0.96

Note: χ^2 difference tests cannot be performed, as the estimated models are not nested and S.-B. scaled χ^2 values cannot be used for χ^2 difference testing (see, Schermelleh-Engel et al., 2003).

The S.-B. scaled χ^2 decreases considerably, and fit indices improve, except for the RMSEA, which remains zero. However, the correlations of the two items ‘Food scares increase my concern about food safety’ and ‘It scares me that there are problems with managing the safety of food’ with other items of the scale, depart from what might be expected on the basis of the item loadings (as indicated by large residual correlations). Therefore, these two items are excluded from the scale. Model 3, which consists of seven items, shows a further improvement of the model’s fit to the data in comparison with the second model (see Table 3.2), and this model is chosen as the final measurement scale of general consumer confidence in the safety of food. In Table 3.3, the standardised factor loadings, the composite reliability and the AVE of the final scale of general consumer confidence in the safety of food are displayed. For ‘optimism’ the AVE is 0.55, and for ‘pessimism’ the AVE is 0.62, which indicates that the scale shows convergent validity. The AVE’s also exceed the squared correlation (0.52) between the two dimensions, which is one of the requirements for discriminant validity. The other requirement is that the correlation between the dimensions ‘optimism’ and ‘pessimism’ should be smaller than 1. This is tested by assessing the difference in fit between the uni-dimensional and the two-dimensional version of the scale. All goodness of fit indices deteriorated for the uni-dimensional scale (s.-b. scaled $\chi^2 = 48.5$ ($p < 0.01$); RMSEA = 0.07; CFI = 0.85; NNFI = 0.77), which indicates that the correlation between ‘optimism’ and ‘pessimism’ is smaller than 1, and that they are therefore distinct dimensions of the confidence scale. On the basis of these tests, it was concluded that the psychometric properties of the scale in terms of convergent and discriminant validity (see Anderson & Gerbing, 1988; Fornell & Larcker, 1981) are satisfactory.

Table 3.3 Standardised factor loadings, reliability and average variance extracted for the final measurement scale of consumer confidence in the safety of food

Optimism	
I am optimistic about the safety of food products	0.70
I am confident that food products are safe	0.70
I am satisfied with the safety of food products	0.82
Generally food products are safe	0.74
<i>Reliability</i>	0.83
<i>Average variance extracted</i>	0.55
Pessimism	
I worry about the safety of food	0.87
I feel uncomfortable regarding the safety of food	0.81
As a result of the occurrence of food safety incidents I am suspicious about certain food products	0.68
<i>Reliability</i>	0.83
<i>Average variance extracted</i>	0.62

Cross-validation

The two-dimensional structure of the 7-item scale is cross-validated by a separate sample. An Internet survey was filled out by 563 respondents that were recruited by means of quota sampling on the basis of gender, age, household size, education level, and area of residence. Again, respondents with any missing values on the confidence items are excluded, leaving 520 (92%) observations for the analysis. The two-dimensional structure of the confidence scale fits the data well (S.-B. scaled χ^2 (13) = 9.8, $p = 0.7$; RMSEA = 0.0; CFI = 0.99; NNFI = 0.98). Both convergent and discriminant validity are confirmed. Multi-group confirmatory factor analysis is applied to assess the equivalence of the scale across the two samples (i.e., the sample used to assess convergent and discriminant validity and the Internet sample to cross-validate the scale), using the approach as suggested by Steenkamp and Baumgartner (1998). The sequential constraints imposed on the item loadings, the item intercepts, the factor covariance, the factor variances, and the error variances of the items do not result in a deterioration of the model fit (see Table 3.4), which indicates that the scale of general consumer confidence in the safety of food is invariant for the two samples. It can be concluded that the scale is robust for the Dutch population.

Table 3.4 Assessment of measurement invariance across samples

	χ^2	S.-B. scaled χ^2	<i>df</i>	RMSEA	CFI	NNFI
Configural invariance	80.4	17.3	26	0.00	0.98	0.97
Metric Invariance	82.7	18.1	31	0.00	0.98	0.98
Scalar invariance	95.8	24.6	38	0.00	0.98	0.98
Factor covariance invariance	99.6	26.1	39	0.00	0.98	0.98
Factor variance invariance	120.0	32.0	41	0.00	0.98	0.98
Error variance invariance	137.3	26.6	48	0.00	0.97	0.98

3.3 Conclusion and discussion

The concept of general consumer confidence in the safety of food can be conceptualised along two dimensions, i.e., optimism and pessimism. Positive (optimistic) and negative (pessimistic) perceptions about the safety of food are not two end poles of a uni-dimensional scale. This indicates that optimism and pessimism are conceptually distinct, and can to some extent co-exist, as evidenced by the finding that 52% of the variance of the two dimensions is common variance, and the other half is unique variance. This confirms similar findings in other domains of consumer behaviour such as the distinction between positive and negative attitudes (Cacioppo, Gardner, & Berntson, 1997; Conner & Sparks, 2002), dispositional optimism and pessimism in the context of health (Kubzansky, Kubzansky, & Maselko, 2004), and trust and distrust (Lewicki, McAllister, & Bies, 1998; Poortinga & Pidgeon, 2003). Also in those domains it has been suggested that positively and negatively oriented perceptions constitute distinct dimensions that can be relatively independent from each other.

Optimism and pessimism may not be activated by the same events, or at the same time. A study by Frewer et al. (2002) in a related field, indicated that food related risk communication differentially influenced perceptions of risk and benefit. That is, during a high level of media coverage about genetically modified food, both perceived risk, which increased, as well as perceived benefit associated with the technology, which decreased, were affected. However, when media coverage of genetic modification of food subsequently diminished, risk perception dropped to the level prior to increased media attention, but perceived benefits with regard to

genetically modified food remained depressed (Frewer et al., 2002). This example shows that a single event can have different consequences for perceived risk and benefit. Similar effects might be found for optimism and pessimism in the context of a food safety incident or risk communication aimed at restoring consumer confidence in the safety of food. Focusing on either optimism or pessimism, or integrating these two dimensions into one measure, may result in a biased view of reality. For example, communication activities might result in increased optimism, but when worries are not taken away by the communication, focusing solely on the degree of optimism leads to an underestimation of the existence of concerns with consumers. Similarly, if only pessimism is being assessed, the situation might be evaluated as alarming when many people show feelings of pessimism, whereas the existence of concerns with consumers does not necessarily indicate that people do not see any positive aspects. Therefore, when optimism and pessimism are not assessed as distinct concepts, important information may be lost.

In future research, the concept of consumer confidence in the safety of food can be embedded in a theoretical framework to investigate consumer perceptions of food safety, where its relationships with other relevant constructs can be assessed. For example, the extent to which optimism and pessimism are differentially influenced by food safety events, as well as the extent to which optimism and pessimism relate to behavioural measures, such as food purchases, can be investigated. Further, the optimism and pessimism dimensions of general consumer confidence in the safety of food can in future applications be used as indices to investigate developments in consumer confidence over time. That is, the measures of optimism and pessimism can function as benchmarks to compare subsequent assessments against, and to examine whether there are any trends in the level of consumer confidence in the safety of food.



4

Understanding consumer confidence in the safety of food: Its two-dimensional structure and determinants

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Abstract

Understanding of the determinants of consumer confidence in the safety of food is important if effective risk management and communication are to be developed. In the research reported here, we attempt to understand the roles of consumer trust in actors in the food chain and regulators, consumer recall of food safety incidents, consumer perceptions regarding the safety of particular product groups, personality characteristics, and socio-demographics, as potential determinants of consumer confidence in the safety of food. Consumer confidence in the safety of food was conceptualised as consisting of two distinct dimensions, namely 'optimism' and 'pessimism'. On the basis of a representative sample of 657 Dutch consumers, structural equation modelling was applied to simultaneously estimate the effect of the determinants on both 'optimism' and 'pessimism'. The results indicated that, to a considerable extent, both optimism and pessimism about the safety of food arise from consumer

trust in regulators and actors in the food chain, and the perceived safety of meat and fish rather than other product categories. In addition, support was found for the notion that optimism and pessimism are conceptually distinct, as these dimensions of confidence were partly influenced by different determinants. The results of this study imply that consumer confidence in the safety of food could be enhanced by improving both consumer trust in societal actors, and consumer safety perceptions of particular product groups.

4.1 Introduction

Food safety incidents, particularly those that are associated with increased consumer concerns, can have substantial negative consequences for the food industry, as well as for regulatory institutions and the development of policy in the area of consumer protection. For example, food safety incidents have, in the past, resulted in trade bans, price fluctuations, culling of animals, decreased consumption of products, damage to the image of the particular industry perceived to be responsible for the incident, as well as to the image of the food industry more generally (Buzby, 2001; Verbeke, 2001). In addition, from a public health perspective, consumer concerns about the safety of particular food products might hamper a healthy food choice. For example, perceived risks associated with the consumption of fish might impose barriers to consumption, whereas fish is considered an important component of the human diet (Verbeke, Sioen, Pieniak, Van Camp, & De Henauw, 2005).

During the course of the last decade, new regulatory institutions have been installed in Europe to more effectively manage food hazards, and to provide sound risk communication about potential food-safety hazards to consumers (Halkier & Holm, 2006; O'Rourke, 2001). Through the open and transparent development of food law, and through taking the appropriate steps to inform the public about food-related hazards, one of the aims of regulatory institutions is to maintain and enhance consumer confidence in the safety of food (Frewer, 2001; Van Kleef et al., 2006). Insight into consumer confidence in the safety of food and its determinants improves food risk management and communication in two ways. On the one hand, insights into consumer confidence in the safety of food and its determinants can be used in the design phase of risk management and risk communication practices. On the other hand, the effectiveness of risk management and communication can be derived, in part, from the level of consumer confidence in the safety of

food. That is, monitoring general consumer confidence in the safety of food can be used to evaluate and adjust policy measures.

Previous research has focused on consumer perceptions of specific food-related hazards and issues of concern (e.g., Bredahl, 2001; Miles & Frewer, 2001; Setbon et al., 2005), and how different hazards are perceived by consumers in terms of various risk characteristics, such as the extent to which hazards are known and dreaded (e.g., Fife-Schaw & Rowe, 1996; Fischhoff et al., 1978; Kirk et al., 2002; Sparks & Shepherd, 1994). Little attention has been paid to the extent to which consumers are confident about the safety of food in general, and what influences this. In order to develop insights into what determines consumer confidence in the safety of food, or lack of it, the aim of this study is to identify the factors influencing general consumer confidence in the safety of food.

Previous studies have identified trust (see, for example, Saba & Messina, 2003; Siegrist et al., 2000), the occurrence of food safety incidents (see, for example, Liu et al., 1998; Verbeke, 2001), and individual differences (see, for example, Dosman et al., 2001; Williams & Hammitt, 2001) as the main determinants of perceived risks and public attitudes towards new food technologies. In general, the literature has investigated these factors separately when examining their relationship to risk perceptions and attitudes. However, in this study we apply an integrated approach where we bring together consumer trust, consumer recall of food safety incidents, personality characteristics, and socio-demographics, as potential determinants of consumer confidence in the safety of food. In addition, we include consumer perceptions regarding food safety associated with particular product groups in order to explain general consumer confidence in the safety of food. Examining the potential determinants of general consumer confidence in the safety of food together will provide more insight in the extent to which each of these factors uniquely contributes to explaining confidence, and which factors are most important for increasing general consumer confidence in the safety of food.

4.1.1 General consumer confidence in the safety of food

In the context of food safety, confidence may indicate the implicit belief that the consumption of food products will not result in adverse health effects for the people consuming them. We define consumer confidence in the safety of food as the extent to which consumers perceive that food is generally safe, and does not cause any harm to their health or to the environment. Confidence is based on familiarity (Siegrist et al., 2003), and develops from the accumulation of positive experiences. However, when established expectations are compromised, for example when a

food safety incident occurs, this might result in reduced confidence (Hansen et al., 2003). Consumer confidence in the safety of food can be accompanied by general affect or emotions. The importance of affect for making judgments has also been stressed by Loewenstein et al. (2001) and Slovic et al. (2004). In addition, previous studies have indicated that consumer perceptions of food-related hazards and new food technologies are often based on emotions such as worry, concern, and fear (Barnett & Breakwell, 2001; Baron et al., 2000; Laros & Steenkamp, 2004; Setbon et al., 2005).

A scale to measure general consumer confidence in the safety of food has been developed and validated in previous research (De Jonge et al., 2007b). It was found that the concept of consumer confidence in the safety of food consisted of two distinct dimensions, i.e., optimism and pessimism. This means that optimism and pessimism should not be regarded as endpoints of a uni-dimensional scale, and that these dimensions can, to some extent, co-exist. For example, Van Rijswijk, Cornelisse-Vermaat, and Frewer (2006) illustrate this by showing that consumers were quite sceptical about the trustworthiness of information provided on product labels, but at the same time indicated that, in general, they trust food labelling. In addition, Poortinga and Pidgeon (2003) make a distinction between the dimensions 'general trust' and 'scepticism.' They argue that a high level of general trust can go together with a high level of scepticism, a form of trust that they refer to as 'critical trust.' Finally, Lewicki et al. (1998) distinguish between 'trust' (characterised by hope and faith) and 'distrust' (characterised by fear and scepticism), which closely relates to the 'optimism' (characterised by satisfaction and confidence) and 'pessimism' (characterised by worry and suspicion) dimensions of consumer confidence in the safety of food (De Jonge et al., 2007b). In the current study we investigate *which* factors influence general consumer confidence in the safety of food and, more specifically, whether optimism and pessimism are *differentially* enhanced by these factors. When the determinants are unequally related to optimism and pessimism, this provides further empirical support for the two-dimensional structure of the concept of general confidence in the safety of food. In addition, insights in the determinants of consumer confidence in the safety of food may provide useful guidelines for risk managers regarding the development of risk communication and the design of policy measures.

4.1.2 The determinants of general consumer confidence in the safety of food

The extent to which consumers are confident about the safety of food may depend, in part, on the extent to which they trust regulatory institutions and producers to

protect consumer interests, as well as the information that these institutions provide about food risks (Grunert, 2002). It has been suggested that conferring trust onto actors in the food chain, such as farmers, retailers, and manufacturers of food products, as well as regulatory institutions responsible for the management of hazards, might help consumers to compensate for their lack of knowledge about the cultivation and production process of foods (Siegrist & Cvetkovich, 2000; Van Kleef et al., 2006). Trust can be characterised as relying on those with responsibility for managing public health and safety (Siegrist et al., 2000). Previous research has indicated that trust in institutions and the food industry was negatively related to perceived risks regarding food safety hazards (Saba & Messina, 2003; Siegrist et al., 2000; Williams & Hammitt, 2001) and genetic engineering (Siegrist, 2000). In addition, Green et al. (2003) found that consumers based their confidence in the safety of food on their level of trust in salespersons, especially the ones they know personally, and regulatory institutions with responsibility for consumer protection.

The occurrence of food safety incidents, as well as the associated extensive media coverage of these incidents, often results in increased consumer perceptions of risk and public concerns (Frewer et al., 2002; Liu et al., 1998; Pennings et al., 2002; Verbeke, 2001; Verbeke & Viaene, 1999). We expect that consumer recall of the occurrence of, or media attention to, food safety incidents is related to lower general consumer confidence in the safety of food. That is, we expect that consumer optimism will be lower, and pessimism will be higher if such incidents are recalled. However, it has been argued that each consumer has an individual risk tolerance, and that risk reducing strategies are only applied when this limit is exceeded (Mitchell, 1998). Therefore, the effect of recall on confidence might depend upon the degree to which consumers perceive the incident to be alarming.

Previous studies have examined to what extent different product groups were perceived by consumers to be risky or unsafe (Berg et al., 2005; De Jonge et al., 2004; Verbeke, 2001). In one of these studies it was assumed that general consumer confidence in the safety of food could be represented by the average of consumer perceptions of different product groups (Berg et al., 2005). However, there is some evidence that safety perceptions of product groups are only partly related to general consumer perceptions about food (Poppe & Kjærnes, 2003). Therefore, we expect that a higher level of confidence in the safety of specific product groups is related to a higher level of optimism and a lower level of pessimism, but that consumer confidence in the safety of food is also influenced by other factors.

Individuals differ in the extent to which they are concerned about food-related hazards (Dosman et al., 2001; Verbeke & Van Kenhove, 2002; Williams & Hammitt, 2001), and food safety in general (De Jonge et al., 2004; Miles et al., 2004). With

respect to socio-demographic variables, it has been reported that women tend to be less confident about the safety of food in general compared to men (Berg, 2004; De Jonge et al., 2004; Miles et al., 2004). In addition, there is some evidence that more educated consumers are less worried about food safety issues (Dosman et al., 2001). Although several studies indicated that young people perceive risks to be lower in comparison with elderly people (Dosman et al., 2001; Miles et al., 2004), the literature is equivocal in this respect (Bouyer et al., 2001; De Jonge et al., 2004; Kirk et al., 2002; Williams & Hammitt, 2001). Children are perceived to be more vulnerable to food-related risks (National Institute for Public Health and the Environment, 2006). However, empirical evidence that people with children are less confident about the safety of food is inconclusive (Dosman et al., 2001; Miles et al., 2004). Another consumer characteristic that might be related to consumer confidence in the safety of food is whether people have experience in their household with food allergy or food intolerance (Miles et al., 2004). We take into account gender, education, age, parenthood, and personal experience with food allergy as potential variables that might be related to consumer confidence in the safety of food.

Besides socio-demographic variables, personality characteristics might be related to consumer confidence in the safety of food. That is, some individuals may consistently show a relatively high level of concern, whereas others hardly ever show any concern. A personality characteristic of particular relevance in the context of food safety is the extent to which consumers have a tendency to worry excessively in general, which is referred to as *trait worry* (Gebhardt & Brosschot, 2002; Meyer et al., 1990). Previous research has indicated that people who are, generally, more prone to worry and stress, also respond to food safety incidents more negatively than those who are low in this trait (Verbeke & Van Kenhove, 2002). In addition, consumer confidence in the safety of food can be hypothesised to depend on individuals' perceived personal control over food risks. In fact, Baron et al. (2000) found that perceived personal control appeared to be one of the most important justifications for not worrying about potential hazards. Furthermore, perceived personal control has been shown to be negatively related to perceived personal risk from food-related hazards (Sparks & Shepherd, 1994; however, see Frewer et al., 1994). We expect that consumers who perceive that they themselves are able to control food risks will be more optimistic and less pessimistic about the safety of food.

4.1.3 The aim of the present study

It is important to better understand consumer confidence in the safety of food and the factors by which this is influenced. On the basis of the existing literature we identified trust, consumer recall of food safety incidents, consumer perceptions regarding the safety of different product groups, socio-demographics, and personality characteristics as potential determinants of general consumer confidence in the safety of food. The first aim of the present study is to bring these factors together in one model, and to assess the contribution of each of them in explaining consumer confidence in the safety of food. The second objective is to examine whether the determinants differentially influence the 'optimism' and 'pessimism' dimension of confidence.

4.2 Method

4.2.1 Data collection and sample

Data were collected in December 2004 by a professional market research agency (GfK Panelservices Benelux B.V.). Participants were recruited from a panel of individuals who had volunteered to take part in questionnaire studies. A link to the questionnaire, which was made available through the Internet by the research agency, was sent to 1250 panel members by email, and 657 respondents filled out the survey within the designated time frame (a response rate of 53%). The characteristics of the sample are displayed in Table 4.1.

4.2.2 Materials

Consumer confidence in the safety of food

General consumer confidence in the safety of food was measured on two dimensions, 'optimism' and 'pessimism', using multi-item measures that were developed and validated in previous research (De Jonge et al., 2007b).

Trust

Consumer trust in the government, farmers, retailers, and manufacturers, was measured using six items for each actor. The items represented the perceived competence, openness, and care for public well-being of the actors in relation to

Table 4.1 Characteristics of the sample

	Sample (%) <i>N = 657</i>	Population^a (%)
<i>Gender</i>		
Male	56.9	49.1
Female	43.1	50.9
<i>Age</i>		
15-19	8.8	7.4
20-24	6.8	7.3
25-29	10.4	7.5
30-39	21.8	18.8
40-49	18.1	18.9
50-64	19.8	23.0
≥ 65	14.3	17.2
<i>Education</i>		
Low	28.3	
Average	39.9	
High	31.8	
<i>Number of children in household</i>		
0	65.0	
1	16.3	
2	14.3	
≥ 3	4.4	

Note: ^a Centraal Bureau voor de Statistiek (2005), figures refer to population numbers on January 1, 2005.

food safety matters, which are regarded to be important aspects of trust (Frewer, Howard, Hedderley, & Shepherd, 1996; Johnson, 1999; Lang & Hallman, 2005; Metlay, 1999; Peters, Covello, & McCallum, 1997; Poortinga & Pidgeon, 2003; Siegrist et al., 2003).

Recall

With regard to consumer recall of food safety incidents and messages in the media about food safety issues, a distinction was made between respondents who recalled

an incident and/or messages in the media about an incident (1), and respondents who did not recall either food safety incidents or messages in the media (0). In addition, it was assessed to what extent recalled messages in the media were perceived to be alarming.

Safety of product groups

A selection was made of 15 different product groups that are part of the daily nutrition of many consumers, and which reflect a broad range of food products. The product groups that were distinguished included fresh products (e.g., milk products), nonperishables (e.g., products in cans), and technologically advanced products (e.g., ready-to-eat meals).

Individual differences

Trait worry was measured using a validated Dutch translation of the Penn State Worry Questionnaire (Gebhardt & Brosschot, 2002). The three items with the highest item-total correlations were included in the questionnaire. *Perceived personal control* was measured with two items. Socio-demographic variables that were included in the questionnaire were gender, education level, age, and the number of children in the household. All respondents indicated whether or not they had household experience of food allergy or food intolerance. The questionnaire items are provided in the Appendix.

4.3 Data analysis

First, the number of respondents who had missing observations was investigated (i.e., how many respondents had used the 'don't know' option). The results indicated that 77% of the respondents had no missing values, 9% had one missing value, 4% had two missing values, and 10% had three or more missing values. Removing all respondents with any missing observations from the analysis would result in a considerable loss in the amount of information. Therefore, it was decided to remove respondents from the analysis when they had more than 5 out of 53 missing values, which resulted in a sample size of 625 (95%), and to estimate the remaining missing observations using two-way imputation (see, Sijtsma & Van der Ark, 2003). Exploratory factor analysis was performed to investigate the underlying dimensions of the 15 product groups. Four components with eigen values of 7.88, 1.20, 1.11, and 0.82, were extracted. Together the components explained 73.4%

of the variance. One item was removed from the scale, because it was not clear on the basis of the factor loadings to which dimension it belonged. The four dimensions had good face validity and were labelled *meat and fish* (4 items, $\alpha = 0.87$), *fresh produce* (4 items, $\alpha = 0.88$), *preserves* (3 items, $\alpha = 0.88$), and *processed foods* (3 items, $\alpha = 0.76$). As missing observations could not be imputed when a respondent did not respond to any of the items of a particular construct, another 8 respondents were excluded from the analysis.

The data were analysed using LISREL 8.72. As LISREL cannot analyse two-item measures, item-scores on the two-item scale of perceived personal control were averaged and analysed as a single-item measure. No conventional estimates of the error terms were available for the single-item measures. For perceived personal control, an estimate of the error component was made on the basis of the reliability of the two items that were averaged to form the final measure of this variable³. With respect to the other single-item measures an assumption of no error was made.

Although no definite cutpoints have been formulated as to when data may no longer be regarded as multivariately normally distributed, the relative multivariate kurtosis of 1.13 does not indicate a substantial deviation from multivariate normality. An inspection of the data indicated that the univariate skewness and kurtosis values, which were on average -0.21 and -0.12, respectively, can be regarded as approximating a normal distribution (Curran, West, & Finch, 1996). Therefore, maximum likelihood estimation was applied to assess the fit of the model to the data. The two-step model validation procedure proposed by Anderson and Gerbing (1988) was followed that first assesses the validity of the measurement constructs, and then the relationships between the constructs. Maximum likelihood estimation was employed using covariances as input for the analysis. The extent to which the determinants were related to both 'optimism' and 'pessimism' was estimated, and optimism and pessimism were allowed to be correlated. Model fit was assessed on the basis of the χ^2 , the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), and the Non-Normed Fit Index (NNFI). For good model fit the χ^2 statistic should be insignificant; however, as sample size influences the χ^2 value (Schermelleh-Engel et al., 2003), this is often not the case. As an indication of the goodness-of-fit, the ratio χ^2/df should be between 2 (good fit) and 3 (acceptable fit). For the RMSEA, values below 0.08 indicate a reasonable fit, and values below 0.05 indicate a close fit of the model to the data (see, Baumgartner & Homburg, 1996). The CFI and the NNFI range from 0 to 1, and higher values (> 0.9) indicate better model fit.

³ The random error variance can be calculated by the formula: $\text{Var}(X_{\text{random}}) = \text{Var}(X_{\text{observed}}) - \text{reliability} * \text{Var}(X_{\text{observed}})$.

4.4 Results

First, the construct validity of the latent variables was examined using confirmatory factor analysis (CFA). The CFA model, where all latent variables were allowed to correlate freely, yielded a good overall fit ($\chi^2 (1025 \text{ df}) = 3002.7, p < 0.01$; RMSEA = 0.06; CFI = 0.97; NNFI = 0.97). The factor loadings of the items, as well as the composite reliability and the average variance extracted (AVE) of the latent variables are displayed in Table 4.2. The AVE of each latent variable exceeded 0.50, which indicated that the variables show convergent validity (Fornell & Larcker, 1981). In addition, the AVE of each latent variable exceeded the squared correlation between that variable and any other latent variable, which is one of the requirements of discriminant validity (Fornell & Larcker, 1981). The other requirement is that the correlations between the latent variables are significantly smaller than 1 (Anderson & Gerbing, 1988). This was established by conducting pair-wise χ^2 difference tests, where the CFA model was compared to a model where one of the correlations between the latent variables was constrained to unity. The results indicated that none of the correlations among the latent variables equalled unity. The psychometric properties of the measurement model confirm that the latent variables can be treated as separate constructs in the structural model.

Second, the structural model was estimated. This model investigated the relationship between general consumer confidence in the safety of food and its determinants. The structural model yielded a good overall fit: $\chi^2 (1284 \text{ df}) = 3378.0$ ($p < 0.01$), RMSEA = 0.06, CFI = 0.97, and NNFI = 0.96. The two dimensions of general consumer confidence, 'optimism' and 'pessimism', were negatively correlated (-0.74). The standardised structural regression coefficients are displayed in Table 4.3. Trust in the government and trust in food manufacturers were significantly related to both optimism and pessimism. The causal paths had the predicted sign, that is, trust increased consumer optimism and reduced consumer pessimism about the safety of food. Trust in farmers and retailers were less strongly related to optimism and pessimism.

Consumer recall of the occurrence of, or media attention to, food safety incidents increased the level of pessimism, but did not influence the level of optimism. To determine whether optimism and pessimism were influenced by the extent to which recalled incidents were found to be 'alarming,' a *t*-test was performed (see Table 4.4). Respondents who recalled a message in the media about a food safety incident were divided into two groups by means of a median split on the basis of the extent to which the recalled message was found to be alarming. The results indicated that respondents who evaluated the media message as alarming were less

Table 4.2 Measurement model of latent variables

Constructs and indicators	Factor loadings	t-value	Composite reliability	AVE	M	SD
<i>Optimism</i>			0.87	0.62	3.62	0.66
optimistic	1.00					
confident	0.95	21.4				
satisfied	1.04	23.6				
generally safe	0.67	19.0				
<i>Pessimism</i>			0.88	0.71	2.76	0.84
worry	1.00					
uncomfortable	0.90	30.3				
suspicious	0.80	21.0				
<i>Trust in government</i>			0.90	0.59	3.27	0.73
has the competence	1.00					
has sufficient knowledge	0.93	15.4				
is honest	1.12	18.9				
is sufficiently open	1.18	19.4				
takes good care	1.20	20.7				
gives special attention	1.03	17.8				
<i>Trust in farmers</i>			0.90	0.61	3.35	0.68
have the competence	1.00					
have sufficient knowledge	0.96	15.9				
are honest	1.24	19.4				
are sufficiently open	1.17	18.5				
take good care	1.25	20.4				
give special attention	1.18	19.1				
<i>Trust in retailers</i>			0.90	0.60	3.08	0.71
have the competence	1.00					
have sufficient knowledge	0.99	17.3				
are honest	0.96	19.3				
are sufficiently open	1.02	19.7				
take good care	1.04	20.7				
give special attention	1.02	19.4				

Table 4.2 Measurement model of latent variables (continued)

Constructs and indicators	Factor loadings	t-value	Composite reliability	AVE	M	SD
<i>Trust in food manufacturers</i>			0.88	0.55	3.44	0.62
have the competence	1.00					
have sufficient knowledge	0.91	12.1				
are honest	1.51	15.9				
are sufficiently open	1.55	15.4				
take good care	1.51	16.5				
give special attention	1.40	15.1				
<i>Meat and fish</i>			0.88	0.64	3.46	0.81
Beef	1.00					
Pork	1.15	28.0				
Poultry	1.02	21.6				
Fish	0.87	20.1				
<i>Fresh</i>			0.88	0.65	4.04	0.66
Fruit and vegetables	1.00					
Milk products	1.44	18.2				
Cheese	1.38	18.2				
Bread products	1.16	16.3				
<i>Processed</i>			0.87	0.63	3.35	0.83
Pre-cut and washed vegetables	1.00					
Ready-to-eat meals	1.14	18.8				
Vitamin supplements	0.96	14.7				
<i>Preserves</i>			0.94	0.78	3.91	0.77
Products in cans	1.00					
Products in jars	0.90	34.8				
Frozen products	0.72	22.0				
<i>Trait worry</i>			0.91	0.72	2.03	0.92
Many situations make me worry	1.00					
I cannot help worrying	0.98	20.3				
I worry about things	0.93	19.6				

$\chi^2 (1025 \text{ df}) = 3002.7, p < 0.01, \text{RMSEA} = 0.06, \text{CFI} = 0.97, \text{NNFI} = 0.97.$

Table 4.3 Structural regression coefficients (standardised)

Independent construct	Optimism		Pessimism	
	Beta	t-value ^a	Beta	t-value ^a
Trust in government	0.23	5.49	-0.11	-2.48
Trust in farmers	0.03	0.74	0.04	0.96
Trust in retailers	0.07	1.76	0.01	0.27
Trust in food manufacturers	0.37	7.42	-0.20	-3.95
Recall	-0.03	-0.88	0.07	2.08
Meat/fish	0.23	3.92	-0.23	-3.52
Fresh	0.11	1.91	-0.02	-0.38
Processed	-0.09	-0.97	-0.07	-0.66
Preserves	0.10	1.67	-0.08	-1.26
Gender	0.00	-0.06	0.02	0.63
Education	0.08	2.55	-0.13	-3.78
Age	-0.06	-1.96	0.12	3.40
Kids	-0.03	-0.86	0.03	0.94
Allergic	0.00	-0.03	0.11	3.39
Trait worry	-0.05	-1.62	0.18	4.91
Control	0.01	0.13	-0.03	-0.62

Note: ^a Based on two-tailed tests: for t-values > 1.96, $p < 0.05$; for t-values > 2.58, $p < 0.01$. Significant coefficients are in bold.

optimistic and more pessimistic about the safety of food, which demonstrates that in addition to recall *per se*, the perceived seriousness of food safety incidents plays an important role in the extent to which these incidents influence consumer optimism and pessimism about the safety of food.

For the product group dimensions, we found significant effects on optimism and pessimism for the *meat and fish* dimension, but not the other product group dimensions. Greater confidence in the safety of meat and fish was related to a higher level of optimism and a lower level of pessimism. The results also showed that consumer confidence in the safety of these product groups was relatively low (see Table 4.2), and that most of the recalled news messages about food safety incidents were related to the *meat and fish* product group dimension (see Table 4.5).

Table 4.4 Means and standard deviations of optimism and pessimism as a function of the extent to which the recalled message was alarming

Extent to which the message was alarming	Optimism		Pessimism	
	M	SD	M	SD
Low (<i>n</i> = 118)	3.83	0.57	2.55	0.79
High (<i>n</i> = 113)	3.34	0.75	3.15	0.86

Note: Ratings made on a five-point scale: 1 = low optimism/pessimism and 5 = high optimism/pessimism.

Education level and age were significantly related to both optimism and pessimism. More highly educated respondents were more confident about the safety of food, that is, they were more optimistic and less pessimistic compared to respondents with a lower level of education. With respect to age, the results indicated that older consumers were less optimistic and more pessimistic about the safety of food. Trait worry was positively related to pessimism, showing that people who tend to worry more in general are also more concerned about the safety of food. Finally, consumers who have experience with food allergy in their own households were more pessimistic about the safety of food.

Overall, a substantial portion of the variance of the endogenous variables is explained by the model: optimism 65% and pessimism 45%. Trust in the government and manufacturers, as well as consumer confidence in the safety of meat and fish appear to be the strongest predictor variables.

Table 4.5 Recalled incidents from the news media by product group dimension

Product group dimension	Number of recalled incidents	
Meat and fish	88	(38.1)
Fresh	72	(31.2)
Preserves	3	(1.3)
Processed products	1	(0.4)
Other / not indicated	67	(29)
Total	231	(100)

Note: Values within parentheses indicate the percentage.

4.5 Discussion

The primary aim of this study was to develop an integrated model to investigate the unique contribution of different determinants in explaining consumer confidence in the safety of food. The results indicate that general consumer confidence in the safety of food is influenced by a variety of factors. Differences exist regarding the importance of the different determinants for increasing general consumer confidence in the safety of food. Consumer trust in societal actors and consumer safety perceptions of particular product groups are most strongly related to consumer confidence in the safety of food. However, this is also dependent on the particular actor and the type of product group. That is, trust in the government and trust in manufacturers are more strongly related to consumer confidence in the safety of food than trust in farmers and retailers. This may be a consequence of the government and food manufacturers being perceived by consumers to be primarily responsible for the safety of food (De Jonge et al., 2004). A lack of trust in these actors may therefore result in lower optimism and higher pessimism about the safety of food in general. With respect to consumer perceptions of the safety of different product groups, the results indicate that consumer confidence in the safety of meat and fish is most strongly related to their level of confidence in the safety of food in general. Due to the occurrence of several food scandals over the past decade (Pennings et al., 2002; Verbeke, 2001; Verbeke & Viaene, 1999), the issue of the safety of meat and the farming methods used in rearing animals for meat has become more salient to consumers (Kirk et al., 2002; Miles et al., 2004; Poppe & Kjærnes, 2003; Verbeke & Vackier, 2004). This is also reflected in consumers' recall of food safety incidents, from which it appears that the majority of recalled incidents relate to the meat and fish product group dimension. Consumer recall of incidents associated with other product groups is less salient. Therefore, consumer concerns about these categories might be less influential on consumer optimism and pessimism about the safety of food in general. Contrary to our expectation, perceived personal control over the safety of food was not related to consumers' optimism and pessimism about the safety of food, although perceived personal control has been identified in previous studies as an important aspect in relation to consumer perceptions of food safety (Baron et al., 2000; Sparks & Shepherd, 1994; however, see Frewer et al., 1994). Potentially, consumer perceptions about food safety in general (i.e., general optimism and pessimism about the safety of food) do not correspond to perceptions about food safety in relation to somebody's personal situation. Consumer perceptions about the safety of food in general may therefore not be directly related to the extent to which consumers

perceive themselves to be able to exert influence on the safety of their own food. In addition, the influence of perceived personal control on optimism and pessimism might depend on the hazard. That is, a stronger relationship of perceived personal control with optimism and pessimism might be expected for those hazards where consumers are more in control, such as food poisoning from home prepared foods (Frewer et al., 1994).

The second objective of this study was to investigate whether the 'optimism' and 'pessimism' dimension of confidence are differentially enhanced by the various determinants. The results show that this is indeed the case, which provides support for the notion that optimism and pessimism are conceptually distinct. Optimism about the safety of food is relatively strongly based on trust and consumer confidence in the safety of product groups, whereas pessimism is also strongly influenced by individual difference variables such as experience with food allergy or intolerance, and trait worry. Apparently, consumers who tend to worry about things in general are also more worried about the safety of food, although they are not less optimistic about the safety of food. In addition, the results indicate that consumer recall of food safety incidents influenced the level of pessimism, but not the level of optimism about the safety of food. Thus it seems that optimism and pessimism are unequally affected by the occurrence of food safety incidents. Consumers who recall food safety incidents are not less optimistic than consumers who do not recall food safety incidents. However, they are more pessimistic. This is the central idea of the 'asymmetry principle' that has been introduced by Slovic (1993) to explain why trust is easier destroyed than created, and for which substantial empirical support has been found (Cvetkovich et al., 2002; Poortinga & Pidgeon, 2004; Siegrist & Cvetkovich, 2001; White & Eiser, 2005).

A limitation of cross-sectional research in general is that no inferences can be made with respect to the generalisability of the results (MacCallum & Austin, 2000). Therefore, future research might assess the validity of the model using a cross-national sample. In addition, more insight into the causality of the relationships might be obtained through investigating changes in consumer confidence in the safety of food and its determinants over time.

Another venue for future research might be to examine the extent to which consumer confidence in the safety of food is predictive of consumer behaviour. It might be expected that consumers with a lower level of confidence are motivated to engage in behaviours that reduce or resolve their concerns (Baron et al., 2000). For example, consumers might indicate a need for more information (Griffin, Neuwirth, Dunwoody, & Giese, 2004). With respect to food choices, consumers with a low level of confidence in the safety of food might be more inclined to buy

branded products or to look at quality labels (Henson & Northen, 2000; Mitchell & Boustani, 1994). In addition, purchase location might be an important factor in reducing perceived risk associated with food products (McCarthy & Henson, 2005; Mitchell, 1998). When low consumer confidence in the safety of food relates to concerns about the production process, for example the use of chemical pesticides or food additives, consumers may switch to organic products (Saba & Messina, 2003), which are perceived to be more safe than conventionally produced products (Williams & Hammitt, 2001).

Insight into the concept of consumer confidence in the safety of food and its determinants can be used in the development of risk communication messages targeted at consumers. For example, the results of this study imply that consumer confidence in the safety of food might be enhanced by improving both consumer trust in societal actors, and consumer safety perceptions of particular product groups. In addition, efforts aimed at maintaining and enhancing consumer confidence in the safety of food may gain effectiveness when risk communication is developed targeted specifically at those consumers who are least confident about the safety of food. Socio-demographic characteristics of consumers who, generally, are less confident about the safety of food, i.e., less educated consumers and the elderly, can be used to establish the content of the message, both regarding the topic and the way in which the information is provided.

Appendix. Questionnaire items

Questionnaire items

Optimism (strongly agree - strongly disagree)

- I am optimistic about the safety of food products
- I am confident that food products are safe
- I am satisfied with the safety of food products
- Generally, food products are safe

Pessimism (strongly agree - strongly disagree)

- I worry about the safety of food
- I feel uncomfortable regarding the safety of food
- As a result of the occurrence of food safety incidents I am suspicious about certain food products

Trust^a (strongly agree - strongly disagree)

- [actor] has / have the competence to control the safety of food
- [actor] has / have sufficient knowledge to guarantee the safety of food products
- [actor] is / are honest about the safety of food
- [actor] is / are sufficiently open about the safety of food
- [actor] takes / take good care of the safety of our food
- [actor] gives / give special attention to the safety of food

Recall (yes/no [first two items]; not alarming at all–very alarming [last item])

- Do you recall a particular incident over the past six months where the safety of food was compromised or threatened?
- Have you seen, heard, or read any news messages in the media over the past six months about an actual food safety incident?
- How alarming did you find the message(s)?

Safety of product groups (no confidence at all–complete confidence)

- How much confidence do you, generally, have in the safety of the following product groups?
- beef
- pork
- poultry
- fish
- products in cans
- products in jars
- fresh vegetables and fruit
- precut and washed fresh vegetables
- milk products
- cheese
- eggs
- bread products
- frozen products
- ready-to-eat meals
- vitamin supplements

Trait worry (not at all typical–very typical)

- Many situations make me worry
- I know I should not worry about things, but I just cannot help it
- I notice that I have been worrying about things

Perceived control (strongly agree–strongly disagree)

- I am in control over the safety of the food products that I eat
- The safety of food products is mainly influenced by how I handle food products

Notes: All items were rated on five-point scales. For all statements, respondents were given the opportunity to tick a 'don't know' answer when they thought they were not able to provide a response.

^a Trust was measured for four different actors: the government, farmers, retailers, and food manufacturers.



5

Consumer confidence in the safety of food and media coverage of food safety issues: A longitudinal perspective

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Abstract

This study develops a longitudinal perspective on consumer confidence in the safety of food to explore how and why consumer confidence changes over time. In the first study, a theory-based monitoring instrument for consumer confidence in the safety of food is developed and validated. The monitoring instrument includes measures of consumer confidence together with their antecedents. Model and measurement invariance were validated rigorously before developments in consumer confidence in the safety of food and its antecedents were investigated over time. The results from the longitudinal analysis show that across four waves of annual data collection (2003-2006), the framework was stable and that the relative importance of the determinants of confidence was, generally, constant over time. Some changes were observed regarding the mean ratings on the latent constructs. The second study explored in more depth how media coverage of food safety related issues affects consumer confidence in the

safety of food through subjective consumer recall of food safety incidents. Across the investigated period, both media coverage and consumer recall of incidents were subject to change. However, the intensity and content of actual media coverage are only weakly related to consumers' subjective recall of food safety incidents. The findings lend support to the notion that food safety incidents differ in their effect on consumer perceptions, such that some events may increase or amplify consumer concerns, and others are attenuated.

5.1 Introduction

Despite the fact that in the developed countries food safety standards and food quality performance are higher than ever before (National Institute for Public Health and the Environment, 2006), various food safety incidents have occurred over the past few decades (see, for example, Frewer & Salter, 2002; Verbeke, 2001). In addition to affecting food safety perceptions related to *specific* product groups, the accumulation of incidents, no matter how different in character and in terms of consequences for public health, may also put pressure on consumer confidence in the safety of food in *general*. One of the priorities of the European Food safety Authority (EFSA) and national food safety authorities is to generate consumer confidence in the safety of food. Monitoring consumer confidence over time is important to evaluate the impact of actions of food safety institutions directed at improving the risk analysis process and protecting the public. The present study develops and validates such a monitoring instrument. The monitor is based on the framework of consumer confidence in the safety of food developed by De Jonge, Van Trijp, Renes, and Frewer (2007a). Within this framework, consumer trust in various actors in the food chain with responsibility for consumer protection, the perceived safety of a range of product groups, and consumer recall of food safety incidents have been identified as key factors that drive general confidence.

Effective monitoring of consumer perceptions is not a trivial task for a number of reasons. First, monitoring requires longitudinal data to assess changes over time in a descriptive sense ('does confidence change over time'). However, to be meaningful for managerial purposes ('why do these changes occur and how can they be managed') an in-depth understanding is needed of how confidence changes over time, in direct relationship with its antecedents. In other words, effective monitoring requires the application of a sound theoretical model that also incorporates the factors that drive general confidence. Second, from a methodological point of view,

comparisons over time in terms of the level of consumer confidence and its antecedents can only be justified if strict criteria regarding model and measurement validity are satisfied. Only if these criteria of model and measurement invariance over time are met, can changes be interpreted unambiguously. Progress in the area of monitoring consumer confidence in the safety of foods has been hampered by the fact that longitudinal data are often not available, and that the key challenges described above have not always been taken into account in previous studies. That is, often developments over time were investigated by comparing consumer responses to individual questions between subsequent surveys, rather than the inter-relationships between the measures (Frewer et al., 2002; Kirk, et al., 2002; Smith et al., 1999; Verbeke, 2001). Although this may provide (preliminary) insight into changes in perceptions and directions of change, potential sources of these changes are difficult to identify. In addition, few previous studies have assessed measurement equivalence (see, Frewer et al., 2002; Kirk et al., 2002; Setbon et al., 2005; Verbeke, 2001), which means that there is more uncertainty regarding whether changes over time are *real* changes, or a result of (slight) changes in the operationalisation (and thereby consumer meaning) of the measures over time.

As consumers have limited ability to assess the safety of foods from personal experience (safety is a credence attribute, see Darby and Karni (1973)), in their assessment and evaluation they rely heavily on information provided by others. It has been argued that the mass media can play an important role in building and undermining consumer confidence in the safety of foods (Verbeke et al., 1999). Under particular circumstances, media attention to a particular risk event may contribute to amplification or attenuation of the risk as perceived by the public (Renn, 1991). However, it is often difficult to predict whether risk amplification or attenuation will occur (Kitzinger & Reilly, 1997). Media attention and coverage has primarily been studied in relation to specific food incidents and food products. This work confirms that the occurrence of incidents and media coverage of these incidents are likely to influence consumer perceptions about the safety of specific product groups or types of food (see, Fleming et al., 2006; Frewer et al., 2002; Verbeke et al., 1999). However, this line of research has not addressed how day-to-day media reporting on the totality of food safety related issues may accumulate to affect general consumer confidence in the safety of food. As consumer information processing is selective (Kahneman, 1973), such effort would require that actual media coverage on the totality of food safety issues is monitored over time in parallel to consumer recall of news media messages, as well as changes in consumer confidence in the safety of food with its antecedents.

In response to these challenges, the first aim of the present study is to develop and empirically validate a monitoring instrument for consumer confidence in the safety of food, which is theoretically founded and methodologically sound. Such a monitoring instrument will allow for formal comparisons of construct means and inter-relationships between constructs over time (Study 1). The second aim of this study is to exploit the longitudinal perspective in order to examine in detail how media coverage of food safety related issues affects consumer confidence in the safety of food through consumer recall of food safety incidents (Study 2).

5.2 Study 1: Monitoring consumer confidence over time

Monitoring on the basis of longitudinal data has several advantages over cross-sectional data. An advantage is that longitudinal data provide 'base level' measurements against which changes in consumer perceptions can be captured. Two types of changes over time can be distinguished. The first lies in the mean ratings on the constructs of the model. Secondly, changes in the strength of the relationships between the constructs of the model can be assessed.

Monitoring on the basis of longitudinal data introduces a number of methodological challenges that are often overlooked. Research in, among others, psychometrics (Farrell, 1994) and marketing (Steenkamp & Baumgartner, 1998) has pointed to the fact that comparisons over time can only meaningfully be made if the data conforms to a number of measurement invariance criteria. That is, comparisons over time can only be justified methodologically if there is sufficient evidence that construct measures have the same content and meaning across different measurement occasions. The issue of measurement equivalence as a necessary condition for making valid comparisons over time has often gone unnoticed or untested in previous studies that investigated consumer perceptions of food safety over time (see, Frewer et al., 2002; Kirk et al., 2002; Setbon et al., 2005; Verbeke, 2001). Previous research compared results obtained in different waves of data collection relying on single-item measures (Smith et al., 1999; Verbeke, 2001), which are considered to have limited reliability and validity since measurement error is not taken into account (Churchill, 1979), and measurement equivalence over time cannot be assessed. Other studies explored changes in mean ratings on multi-item constructs. However, since these multi-item measures were based on exploratory methods rather than confirmatory factor analyses (Frewer et al., 2002; Kirk et al., 2002; Setbon et al., 2005), and not tested on measurement equivalence, such comparisons are less reliable. In terms of comparing the strength of relationships (i.e., regression coefficients) within a conceptual model over time, previous

research tended to estimate separate models for each measurement occasion (Dosman et al., 2001; Setbon et al., 2005). Again, such an approach yields less reliable results, unless measurement invariance of latent constructs has been confirmed, and formal testing procedures are implemented for the comparison of regression coefficients over time.

Only when measurement equivalence is established, formal comparisons over time are justified regarding the mean scores on the model constructs, and the strength of the relationships within the structural model. When these conditions are not met, the results and managerial implications arising from them, should be interpreted with great care. Structured approaches (Farrell, 1994; Koufteros & Marcoulides, 2006; Steenkamp & Baumgartner, 1998) that allow for such formal comparisons have been developed within the context of multi-group structural equation modelling (e.g., LISREL) to systematically assess the measurement properties of the model and to statistically explore changes over time. In this study such a structured approach (see, Byrne, 1998; Jöreskog & Sorböm, 1996, for further details) is applied in the context of the monitor on consumer confidence in the safety of food.

5.2.1 Method

Sample

Consumer perceptions about the safety of food have been assessed in four annual surveys. Data collection took place during a three-week period in November and December in all four years. Data were collected by a professional market research agency (GfK Panelservices Benelux B.V.), and quota sampling was performed on the basis of gender, age, education level, household size, and area of residence. Administering the survey took place through the Internet. In the Netherlands, Internet access from home is common (83%). Even the segment with the lowest Internet usage from home (lower educated persons) has an access rate of 73% (Centraal Bureau voor de Statistiek, 2006). The four surveys were conducted with different respondents. In total, 4458 respondents were invited to take part in the research, and 2504 respondents filled out the questionnaire (a response rate of 56.8%). Some variation existed between the samples regarding gender, education level and number of children in the household (see Table 5.1). In comparison with national population statistics on gender, age, education level, and household size the samples can be regarded as approximately representative for the Dutch population. Respondents with more than 4 missing observations out of 45 items (6.9%),

and respondents who had missing values on all items of a particular construct (0.4%, beyond respondents with > 4 missing observations) were not included in the analysis. For the remaining respondents (92.7%), an estimation of the missing values was made using two-way imputation (see, Sijtsma & Van der Ark, 2003) for each sample individually. This resulted in 515 observations suitable for analysis in 2003, 616 in 2004, 577 in 2005, and 614 in 2006.

Materials

The monitor for consumer confidence in the safety of food is based on the theoretical framework developed by De Jonge et al. (2007a). Measures (see Appendix) for the key constructs of general consumer confidence in the safety of food (optimism and pessimism), consumer trust in different actors in the food chain (the government, farmers, retailers, and the food industry), consumer recall of food safety incidents, and the perceived safety of a range of different product groups were taken from that source (De Jonge et al., 2007a). The constructs of perceived control and trait worry are not included in the analysis, because data on these constructs were not available in 2003. Consumer recall of food safety incidents was included in the framework as a dummy variable which indicated whether a consumer recalled an incident or not. When respondents indicated to recall a food safety incident, they were, in addition, asked to indicate what incident they recalled. Each respondent could enter up to three recalled incidents. Finally, information was administered on gender, education level, age, the number of children in the household, and household experience of food allergy or food intolerance.

Data analysis

The four waves of data were analysed using multi-group structural equation modelling. In multi-group analysis, each wave of data collection is considered as a separate group. By simultaneously estimating the model for the different measurement occasions (i.e., groups), it can be established whether the properties of the measurement model are stable over time, whether the mean scores on the constructs differ over time, and whether the relative importance of the antecedents of confidence change over time. LISREL 8.72 software was used for the estimation. Maximum likelihood estimation was employed using covariances as input for the analysis. To identify the model, the factor loading of one item per construct was set to one, and the intercept of the same item was fixed to zero. Items with a moderate amount of variance were chosen as marker items (Little, Slegers, & Card, 2006).

Table 5.1 Sample characteristics (%)

Data collection period	2003	2004	2005	2006
	N = 563	N = 657	N = 608	N = 676
	November 27 – December 10	November 18 – December 8	November 18 – December 11	November 17 – December 8
<i>Response rate</i>	58.5	52.6	49.4	66.7
<i>Gender</i>				
Male	66.8	56.9	54.3	55.9
Female	33.2	43.1	45.7	44.1
<i>Age</i>				
15-19	8.7	8.8	7.6	7.7
20-24	10.1	6.8	6.4	7.9
25-29	9.1	10.4	10.0	9.8
30-39	20.2	21.8	21.1	20.8
40-49	17.4	18.1	18.8	18.4
50-64	19.5	19.8	20.7	20.8
65+	14.9	14.3	15.5	14.7
<i>Education level</i>				
Low	21.5	28.3	25.2	30.6
Average	43.5	39.9	37.3	39.8
High	35.0	31.8	37.5	29.6
<i>Number of children</i>				
0	65.5	65.0	64.3	72.9
1	15.3	16.3	16.1	17.5
2	14.7	14.3	14.1	8.0
3 or more	4.4	4.4	5.4	1.6
<i>Allergic</i>				
Yes	19.5	18.7	18.8	18.8
No	80.5	81.3	81.3	81.2
<i>Household size</i>				
1 person	11.4	11.6	12.5	13.8
2 persons	37.1	39.3	37.0	47.3
3 or more persons	51.5	49.2	50.5	38.9

Regarding the single-item measures covering socio-demographic information and recall of incidents, an assumption of no error was made. Estimations of the latent means are dependent upon which item is used as the marker item, because the scale of the construct mean is set to be equivalent to that of the chosen marker item. As such, the absolute values of the latent means should not be considered as 'true' scale values, and are only useful for comparing means of the same construct over time.

The analytic strategy involved three steps. First, the measurement models were evaluated and tested on measurement equivalence. The general approach as outlined by Steenkamp and Baumgartner (1998) was followed where, in a sequence of steps, more stringent constraints were cumulatively imposed on the parameters⁴. Secondly, longitudinal changes in the mean ratings on the latent constructs were assessed. In the third step, differences over time in the structural parameters were investigated. Assessments of differences between the structural relationships over time were made by establishing the change in model fit of two competing models: one in which the structural relationships were freely estimated for each wave of data collection, and one where these relationships were constrained to be equal over time.

Model fit and comparison between subsequent models was assessed on the basis of χ^2 , the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), and the Consistent Akaike Information Criterion (CAIC). The RMSEA and CFI range from 0 to 1. A RMSEA value below 0.08 indicates a reasonable fit, and when RMSEA is below 0.05 the model is considered to closely fit the data (Baumgartner & Homburg, 1996). For CFI higher values indicate better model fit. Typically, $0.95 \leq CFI < 0.97$ is considered to be an acceptable fit, and $0.97 \leq CFI \leq 1.00$ is considered a good fit (Schermelleh-Engel et al., 2003). The χ^2 -change of subsequent models should be insignificant. However, as the test is affected by sample size, for large samples relatively modest differences can become significant (Schermelleh-Engel et al., 2003). Therefore, the extent to which model improvement had been achieved was also evaluated with CAIC, which adjusts for model parsimony.

5.2.2 Results

Following Steenkamp and Baumgartner (1998) the measurement model was tested in a sequence of steps. On the basis of the modification indices some parameters

⁴ Consecutively, the measurement model was tested for configural invariance, metric invariance, scalar invariance, factor covariance invariance, factor variance invariance, and error variance invariance.

that were not equivalent across the groups were set free, and partial measurement invariance was reached. The most parsimonious measurement model (i.e., the model with equivalent parameter estimates over time, except where significant differences were found) showed a good fit to the data: $\chi^2(5207) = 16023.24$, $p < 0.01$; RMSEA = 0.063; CFI = 0.96; and CAIC = 19635.26. In comparison with the model where all parameters were estimated individually, CAIC substantially reduced in value, which shows that the increased model parsimony of the partial measurement invariance model outweighs allowing for group differences. The composite reliability (CR) of the constructs was on average 0.87 and at least 0.77. Also in terms of the average variance extracted (AVE) the psychometric properties of the constructs were good: The mean AVE was 0.62, with a lowest value of 0.53. These results show that the measurement model is stable over time, and provide support for the framework as developed by De Jonge et al. (2007a).

Subsequently, the relative importance of the antecedents with respect to explaining consumer confidence in the safety of food was investigated over time. Hereto, the model with all structural parameters constrained to be equal across time was compared against the model with all structural parameters estimated individually per measurement occasion. The strength of the interrelationships between the constructs was found to be constant over time with one exception; in 2003 the perceived safety of meat and fish was stronger related to consumer optimism than was the case in the other years, although this relationship was significant in all years. The path from 'perceived safety of meat and fish' to 'optimism' was set free for the year 2003 in order to take into account the different size of the parameter in this year. The resulting model fit was as good as the model where all the parameters were estimated individually, but far more parsimonious, since all parameters but one were constrained to be equal over time. The structural regression coefficients of this model are displayed in Table 5.2.

The relative importance of the different factors influencing optimism and pessimism was in line with the results obtained by De Jonge et al. (2007a). Trust in actors in the food chain and regulators are most strongly related to optimism and pessimism about the safety of food, particularly trust in food manufacturers and the government. With respect to the different product group dimensions, the results indicate that the perceived safety of meat and fish explain most unique variance, and is significantly related to both optimism and pessimism. Further the results show that consumers who recollect incidents tend to be less optimistic and more pessimistic about the safety of food. With respect to the background variables, the results indicate that educated consumers are more confident about the safety of

Table 5.2 Standardised coefficients structural model

Independent construct	Optimism		Pessimism	
	Beta	t ^a	Beta	t ^a
Trust in government	0.18	8.56	-.09	-3.56
Trust in farmers	0.06	3.09	0.01	0.50
Trust in retailers	0.12	5.83	-0.01	-0.46
Trust in food manufacturers	0.32	13.13	-0.22	-7.88
Perceived safety meat/fish				
2003	0.32	7.68	-0.24	-7.14
2004-2006	0.13	4.46	-0.24	-7.14
Perceived safety fresh	0.10	3.62	0.02	0.66
Perceived safety preserves	0.05	1.95	-0.04	-1.34
Perceived safety processed	0.03	0.67	-0.13	-2.80
Recall (RI)	-0.07	-4.72	0.09	4.82
Gender	-0.01	-0.35	0.02	0.95
Education	0.03	2.24	-0.11	-6.01
Age	-0.05	-2.89	0.08	4.21
Kids	0.00	-0.26	-0.01	-0.50
Allergic	-0.01	-0.78	0.04	1.92

Notes: ^a Based on two-tailed tests: for *t*-values > 1.96, *p* < 0.05; for *t*-values > 2.58, *p* < 0.01. Significant coefficients are in bold.

food compared to lower educated consumers, and older consumers tend to have less confidence in the safety of food compared to younger consumers.

Comparison of the latent means reveals some small changes over time (Table 5.3), for example increased pessimism about the safety of food in 2003. Also trust in retailers and food manufacturers was reduced in 2004 and 2005, similar to the perceived safety of processed foods. In addition, there were some minor changes without a clear pattern regarding the perceived safety of fresh produce. Interestingly, the perceived safety of meat and fish products appears to show a slight downward trend where perceived safety was significantly higher in 2003 than in 2006.

Table 5.3 Latent means (SE)

	2003	2004	2005	2006
Optimism	3.78 (0.033)	3.75 (0.028)	3.74 (0.029)	3.76 (0.028)
Pessimism	2.91 (0.043) ^b	2.72 (0.038) ^a	2.74 (0.039) ^a	2.70 (0.038) ^a
Trust - government	3.32 (0.035)	3.28 (0.033)	3.27 (0.034)	3.29 (0.033)
Trust - farmers	3.29 (0.034)	3.29 (0.032)	3.27 (0.032)	3.32 (0.032)
Trust - retailers	3.13 (0.034) ^c	3.04 (0.032) ^{a,b}	3.01 (0.033) ^a	3.09 (0.032) ^{b,c}
Trust - food manufacturers	3.59 (0.033) ^b	3.48 (0.031) ^a	3.48 (0.032) ^a	3.58 (0.031) ^b
Perceived safety meat and fish	3.59 (0.039) ^b	3.52 (0.036) ^{a,b}	3.53 (0.037) ^{a,b}	3.48 (0.037) ^a
Perceived safety fresh produce	4.08 (0.031) ^{a,b}	4.08 (0.029) ^b	4.14 (0.029) ^b	4.02 (0.029) ^a
Perceived safety preserves	3.96 (0.029)	3.95 (0.027)	3.94 (0.027)	3.93 (0.027)
Perceived safety processed products	3.34 (0.041) ^b	3.20 (0.037) ^a	3.24 (0.038) ^a	3.40 (0.037) ^b

Note: The superscripts indicate mean differences, where different superscripts indicate significantly different means ($p < 0.05$).

5.2.3 Discussion study 1

Across four waves of annual data collection (2003-2006) and using a formalised, validated monitoring approach, the results from study 1 provide support for the framework developed by De Jonge et al. (2007a). The pattern of the parameters, i.e., the importance of the different factors that influence general consumer confidence in the safety of food, is similar to the results obtained by De Jonge et al. (2007a). Importantly, the results reveal that the relative importance of the determinants, i.e., the size of the parameters, is generally stable over time. In 2003 the perceived safety of meat and fish was more strongly related to optimism than in other years. Also, in 2003 the level of pessimism about the safety of food was significantly higher than in subsequent years. A possible explanation for this effect might be the Avian Influenza H7N7 outbreak in the Netherlands in 2003, which was associated with the culling of 30 million of poultry.

As food safety is a credence attribute, media coverage provides an important link between the occurrence of food safety incidents and consumer confidence in the safety of food. In the theoretical framework this is accounted for through the measure of consumer recall of food safety incidents. Indeed, the results from the current study indicate that many consumers recall food safety incidents, and that recall is subject to changes over time ($\chi^2(3) = 28.18, p < 0.01$). However, the opera-

tionalisation of consumer recall (a dummy variable) does not allow for a more in depth exploration of whether and how media attention affects consumer confidence through recall of food safety incidents. In a complementary attempt to further substantiate specific results from the monitor, such as the stronger relationship between the perceived safety of meat and fish and optimism, as well as the higher level of pessimism in 2003, study 2 was designed: an analysis of objective media coverage of food safety issues, and its effect on consumer recall of food safety incidents over time.

5.3 Study 2: Media coverage of food safety issues

The media are an important source of information on which consumers can (partially) base their beliefs (Kasperson et al., 1988; Verbeke et al., 1999). This is particularly true for beliefs about credence attributes, such as food safety, which consumers can not base on their personal experience with the product. This process where beliefs are formed on the basis of external information is known as informational belief formation (see, Fishbein & Ajzen, 1975; Steenkamp, 1990). Study 1 confirmed that recall of food safety incidents significantly influences both consumer optimism and pessimism about the safety of food. In study 2 we explore to what extent recall of food safety incidents is related to both the intensity and content of media coverage.

Previous research in the area of food safety suggests that the occurrence of incidents and media coverage of these incidents affect consumer perceptions about the safety of specific product groups or types of food (see, Fleming et al., 2006; Frewer et al., 2002; Verbeke et al., 1999). For example, Frewer et al. (2002) found that during high levels of media communication about genetically modified food, consumer risk perceptions associated with the technology increased and consumer benefit perceptions decreased. In addition, Fleming et al. (2006) found that consumer concerns about food safety were negatively influenced by media coverage, particularly when consumers elaborately processed and actively reflected on the news. Typically these studies have examined media coverage of specific highly publicised food-related hazards, such as Bovine Spongiform Encephalopathy (BSE) (Schupp, Gillespie, O'Neil, & Prinyawiwatkul, 2006; Smith et al., 1999), and new food technologies such as genetically modified food (Frewer et al., 2002) and nanotechnology (Anderson, Allen, Petersen, & Wilkinson, 2005). We extend this research to explore the intensity and content of the totality of day-to-day media reporting on food safety issues and how this affects consumer recall of specific food safety incidents.

Information processing on the part of the consumer is selective, implying that although media are an important vehicle of food safety information (Lofstedt, 2006), not all information from the media will be used in belief formation. That is, consumers pay attention to food safety information selectively, because they are not aware of or interested in all information, and some information will have a larger impact than other information (Eagly & Chaiken, 1993; Kasperson, 1992). The research question guiding study 2 is to what extent consumer recall mirrors actual media coverage of food safety issues, an issue that has not been examined previously.

Therefore, the aim of the second study is to provide a systematic, longitudinal analysis of media coverage of food safety related issues, and to more extensively explore the link between media attention and consumer recall of food safety incidents over time. For this purpose, data regarding consumer recall of food safety incidents from study 1 are analysed more in-depth, and related to the intensity and content of actual media coverage on food safety issues.

5.3.1 Method

Similar to the consumer confidence monitor, media coverage of food safety issues was assessed over the period 2003 to 2006. A search on media coverage of food safety issues was conducted in the digital LexisNexis database from 18 November 2002 to 17 November 2006, such that media attention was covered up to one year prior to each round of consumer data collection. The search was restricted to four main Dutch national, daily newspapers, i.e., De Telegraaf, De Volkskrant, NRC Handelsblad, and Trouw, which have on average a combined market share of 75% (Persmediamonitor, 2008). A search term was developed including target words covering a range of food-related hazards, sources of contamination, as well as general terms related to food, risk, and safety (see Table 5.4). These target words were selected on the basis of food-related hazards known from previous research in this area (Fife-Schaw & Rowe, 1996; Miles et al., 2004; Sparks & Shepherd, 1994). Additional target words were retrieved from a collection of newspaper clippings, as well as terms indicated by respondents when asked about their recall of food safety incidents. Articles were included if they contained at least one hazard term, one term referring to food or a food product, and a term indicating potential risk. That is, in Table 5.4 the search terms *within* the three columns were combined on the basis of 'OR', and *between* the different columns on the basis of 'AND'. Based on closer inspection, the initial database of full text articles was further narrowed down to include only those articles that dealt with food-related hazards or food safety incidents. Recipes, book reviews, editorials, letters to editors, and brief introductions to main

articles within the same newspaper were excluded from further consideration. This selection process resulted in 1967 articles suitable for further analysis. The validity of the search term regarding its ability to retrieve all relevant articles that had been published in the news media, was assessed through an additional search using specific target words that were associated with specific incidents and food safety issues⁵. For example, articles on pesticide residues in fruit and vegetables were investigated using the terms 'tangerine', 'grapes', 'cucumber', 'lettuce', 'strawberry', and 'nectarine' for the food terms (second column Table 5.4) instead of 'fruit' and 'vegetables'. The additional search with more specific target words resulted in 120 (6%) unique articles, which indicates that the initial search term used can be regarded as valid and reliable. The 120 articles were added to the database of the 1967 articles already retrieved, and further analysis focused on all 2087 articles.

All articles were coded on year and month of appearance, the newspaper in which the article appeared, the number of words of the article, the type of hazard, and the product group involved. A detailed coding scheme was developed for the coding of hazards and product groups to reflect specific issues in the media and in subjective recall (see appendix B and C). The selection and coding of the articles was performed by two independent researchers. Part of the selection (12%) and coding (10%) was performed by both raters, to allow an assessment of inter-rater reliability using Cohen's Kappa index of inter-rater reliability, a measure for agreement between raters corrected for the number of agreements by chance (Perreault & Leigh, 1989). Kappa can range from 0 to 1, with larger values indicating better inter-rater reliability. Generally, a value of Kappa > 0.70 is considered satisfactory. There was sufficient agreement between the raters regarding the relevance of newspaper articles (Kappa 0.84), the product group involved (Kappa 0.81), and the hazard involved (Kappa 0.77). Before the articles were content analysed, disagreement between the two raters regarding the inclusion or coding of an article was discussed until agreement was reached.

5.3.2 Results

Regarding intensity of media coverage, over the four year period (2003-2006) a total of 2087 messages related to food safety issues hit the media, ranging from 441 in

⁵ Due to limitations regarding the number of characters in the search term, the main search term was developed such that it included terms that would result in the retrieval of the best possible set of articles. As a consequence, very specific words such as different types of fruits and vegetables could not be incorporated in the search term, but only general terms such as 'fruit' or 'vegetables'. Through comparing the set of articles obtained through using a more specific search term, the degree to which relevant articles were not found by the main search term could be assessed, and the quality of the main search term evaluated.

Table 5.4 Target words (translated)

Hazard / source of contamination / food safety institution	Food / product	Risk
Pigs plague	Food (!, *)	Alarm
Bird flu (*)	Product (!)	Food (!) to cover 'food crisis' / 'food incident' / 'food scandal'
Mad cow disease	Meat (!)	Safe / unsafe
BSE	Chicken (!, *)	Harmful / harmless
Creutzfeldt-Jakob	Pig / pork (!)	Danger (!)
Foot and mouth disease (and abbreviation)	Cow / beef (!)	Ill (!)
Dioxin (!)	Fish (!)	Death (!, *)
acrylamide	Dairy (!)	Public health
Genetic modification (!)	Milk (!)	Risk (!)
Hormone (!,*)	Bread (!)	Cancer (!)
Mycotoxin (!)	Vegetables (!)	
Pesticide (!,*)	Fruit	
Campylobacter (!)	Animal feed (!, *)	
Salmonella (!)		
Listeria (!)		
e. coli (!)		
Poison (!,*)		
Glass (!)		
Gone off		
Bacteria (!)		
Contaminated (!, *)		
Antibiotic (!)		
Food infection (*)		
VWA (abbreviation Dutch food safety authority)		
EFSA (abbreviation European food safety authority)		

Notes: The quotation mark indicates that variations on words were accepted, such that, for example 'dioxin!' would result in articles containing the word 'dioxin', but also 'dioxins'. An asterisk indicates that synonyms to the term were included as search terms, for example a synonym for 'poison' [Dutch: 'gif'] was used [Dutch: 'vergif'].

2004 to 593 in 2003, with 2005 (464 messages) and 2006 (589 messages) in between (see Figure 5.1). The intensity of consumer recall of food safety incidents, as obtained from the monitor of consumer confidence in the safety of food, also varied over time. The percentage of consumers recalling at least one incident was highest in 2004 (45%), and lowest in 2005 (32%) with 2006 (35%) and 2003 (43%) in between.

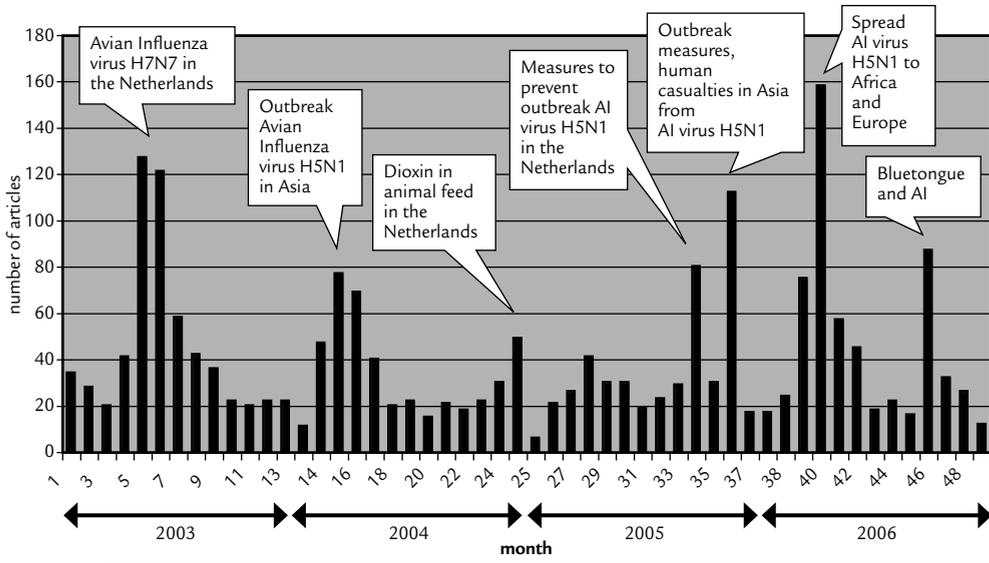


Figure 5.1 Media coverage over time

In terms of content of media coverage, the large peaks in Figure 5.1 reveal that Avian Influenza dominated media coverage in all four years. In addition, there is a peak of messages by the end of 2004 where the discovery of dioxin in animal feed, milk and meat received much attention, and in 2006 when bluetongue (a disease among ruminants) was in the news. In terms of the content of media coverage and consumer recall, Figures 5.2 and 5.3 relate media coverage to actual consumer recall of food safety incidents in terms of hazards (Figure 5.2) and product groups (Figure 5.3).

Regarding the hazards, the overall correlation between media coverage and recall was insignificant ($\tau(26) = 0.062, p = 0.649$), indicating that discrepancies exist regarding issues discussed in the media and what is recalled by consumers. In all periods, Avian Influenza stands out as the hazard with most coverage. In 2003 and 2005, Avian Influenza is also recalled most, respectively by 8% and 10% of the

respondents. It is remarkable from Figure 5.2 that substantial coverage of genetic modification across the four year period (on average 13% of the articles) is hardly reflected in consumer recall. The reverse pattern is also observed; a high level of recall (9%) related to microbiological contamination (2006) that would not be expected on the basis of the amount of media coverage (3% of total coverage in that year). Also adulteration of food products is recalled by relatively many consumers (4.5% on average), however, hardly reported in the media (0.6% on average).

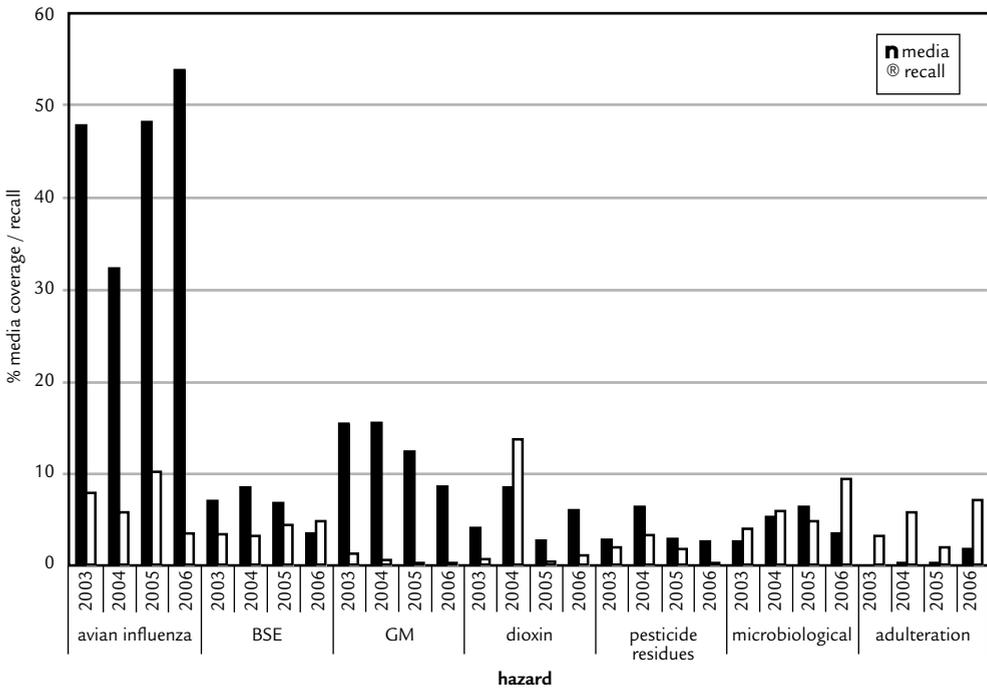


Figure 5.2 Media coverage and recall related to hazard

For the product groups, media coverage and recall are correlated marginally significant ($\tau(30) = 0.237, p = 0.058$). Figure 5.3 shows that poultry is by far the most prominently covered product group in the media. In 2003 and 2005 poultry is also recalled by most respondents, 8% and 9% of the respondents respectively mentioned poultry. Regarding dairy products and animal feed, an increased level of media coverage in 2004 due to a contamination of animal feed with dioxin was associated with increased recall. Even though overlapping patterns in media cover-

age and recall can be identified, there are also several deviations from this pattern. The results show that recall of incidents with baby food (all years) and cheese (2006) were considerably higher than what might be expected on the basis of the media attention devoted to these issues (Figure 5.3).

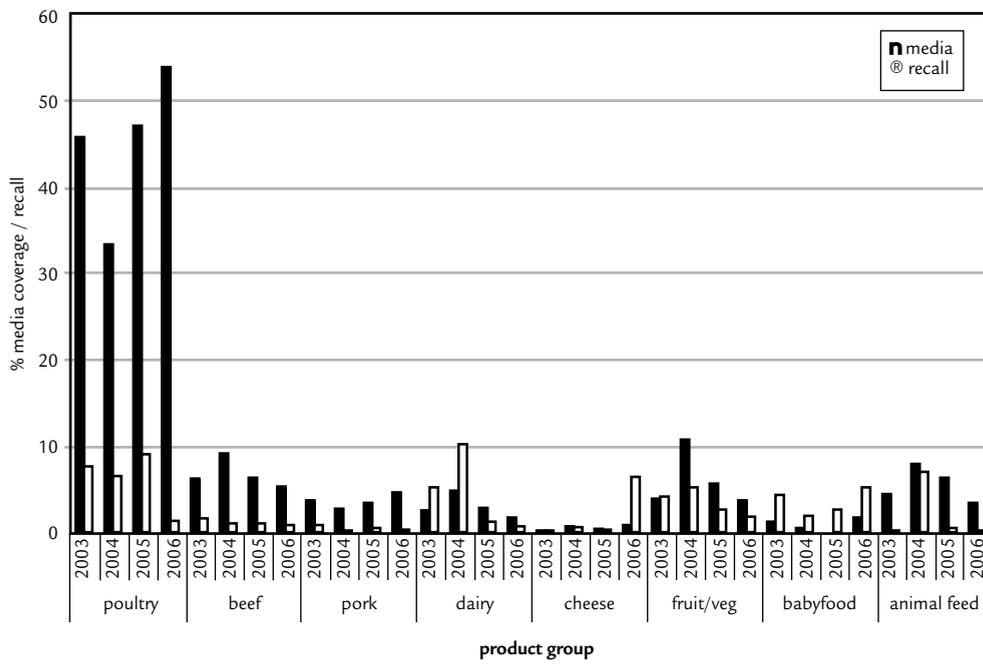


Figure 5.3 Media coverage and recall related to product group

In sum, the results show that in addition to some overlapping patterns in media coverage and recall, discrepancies exist between the issues discussed in the news media and incidents recalled by respondents.

5.3.3 Discussion study 2

Complementary to study 1, which identified subjective recall of food safety incidents as a determinant of consumer confidence in the safety of food, the results from study 2 indicate that media coverage, in terms of the percentage of articles that discuss particular hazards and product groups in a particular period, is weakly related to subjective consumer recall of food safety incidents. This seems to

confirm that consumers are selective in the food safety information they pick up from the media. In some cases, such as genetic modification, high media coverage was not reflected in consumer recall. Other cases, such as salmonella contamination of cheese, adulteration of food products, and incidents involving baby food, were characterised by low media coverage and a high level of recall.

At least three factors may explain discrepancies between media coverage and recall. First, previous research (Frewer, Howard, Hedderley, & Shepherd, 1997; Kasperon et al., 1988; Renn, 1991; Sparks & Shepherd, 1994) has pointed to the fact that information on food safety hazards may have a differential effect on consumer response, depending on characteristics of media coverage (e.g. the amount of coverage, the context in which news media messages are presented, disagreement between actors in the risk debate, dramatisation of risk information, and framing of the message), and characteristics of the hazard (e.g., immediacy of potential consequences of the hazard, and the extent to which the issue has personal relevance). These risk communication features may either amplify or attenuate the impact of risk events on perceptions of risk in society. In the present context, genetic modification was relatively intensely covered in the media but not in a sensational way, which might explain why recall was suppressed. Conversely, incidents with baby food might have been better recalled due to the high level of personal relevance. Second, in this study we only focused on the intensity of media coverage in newspapers. Although newspaper articles may be expected to be an accurate reflection of total attention, media attention in other channels may also have contributed to the level of subjective consumer recall. For example, the incident with Dutch farmhouse cheese was intensively covered in a television show, which may explain why this incident was relatively well recalled by consumers. The final explanation is more psychological in nature. The findings suggest that consumers tend to categorise information on product-related food hazards either in the 'hazard box' or the 'product group box'. That is, of the recalled incidents, *only* the hazard was mentioned in 38% of the cases, and *only* the product group was mentioned in 18% of the cases. Both hazard and product group were mentioned in 34% of the cases, whereas in the media, both were specified in 85% of the articles. The different levels of specificity between recall and media coverage makes their association suppressed.

Overall, this study was a first attempt to explore how subjective recall of food safety incidents is related to objective media coverage, which was based on key words search and coding of the newspaper articles focusing on main categorisations of hazards and product groups. We do not find a strong relationship. Future research might investigate media coverage and recall by applying more compre-

hensive coding to further explore whether the discrepancy is due to substantive (i.e., 'subjective recall is not linearly related to objective media coverage'), or methodological (i.e., 'requires more detailed coding schemes') factors.

5.4 General discussion

This study developed and empirically validated a monitoring instrument for consumer confidence in the safety of food based on the conceptual framework developed by De Jonge et al. (2007a). Such a monitor allows all stakeholders that share responsibility on food safety to keep informed about how confidence develops in the complex environment of the food production system. Methodologically, the monitor provides strong support for the De Jonge et al. (2007a) framework in terms of measurement and model quality. Across the four year period that was investigated (2003-2006), it has been shown that consumer confidence, as well as its antecedents, have been remarkably stable over time, and also the relative impact of the determinants on confidence has been constant. At first sight this may be remarkable considering the dynamics in media attention over the four year period. Yet, the results from study 2 show that objective media coverage has limited predictability regarding consumers' subjective recall of food-related hazards, which underpins their confidence in the safety of food.

The results also indicated that in the Netherlands in the period from 2003 to 2006, both objective media coverage and subjective recall have been dominated by Avian Influenza. In 2003, the Netherlands experienced the first outbreak of Avian Influenza since 1926. Banning the epidemic resulted in the culling of millions of animals, discussions about the method that was applied to kill the animals, as well as discussions about the way in which animals intended for consumption were held (Berenschot, 2004). The fact that the outbreak occurred in the Netherlands, and that it was the first outbreak since a long time, might explain the increased level of pessimism in 2003, and the increased strength of the relationship between the perceived safety of meat and fish with optimism, also in 2003.

Future research may further investigate specific characteristics of media coverage, such as framing of messages, in order to improve understanding of why some events have a large societal impact, and are attenuated.

Overall, the developed monitor for consumer confidence in the safety of food provides an important policy tool, not only to assess changes in consumer confidence in the safety of food, but also in its underlying determinants. Insight into how confidence and its determinants develop over time, provides policy makers with concrete bench marks, and might help them to identify where action should be taken when the aim is to strengthen consumer confidence in the safety of food.

Appendix A. Questionnaire items

Questionnaire items

Optimism (strongly agree - strongly disagree)

- I am optimistic about the safety of food products
- I am confident that food products are safe *
- I am satisfied with the safety of food products
- Generally, food products are safe

Pessimism (strongly agree - strongly disagree)

- I worry about the safety of food *
- I feel uncomfortable regarding the safety of food
- As a result of the occurrence of food safety incidents I am suspicious about certain food products

Trust^a (strongly agree - strongly disagree)

- [actor] has / have the competence to control the safety of food
- [actor] has / have sufficient knowledge to guarantee the safety of food products
- [actor] is / are honest about the safety of food
- [actor] is / are sufficiently open about the safety of food
- [actor] takes / take good care of the safety of our food
- [actor] gives / give special attention to the safety of food *

Recall (yes/no [first two items]; open-ended question [last item])

- Do you recall a particular incident over the past six months where the safety of food was compromised or threatened? *
- What incidents do you recall?

Safety of product groups (no confidence at all - complete confidence)

- How much confidence do you, generally, have in the safety of the following product groups?^b
- | | |
|-----------------------------------|---|
| – beef [MF] | – products in cans [Pres] |
| – pork [MF] * | – products in jars [Pres] |
| – poultry [MF] | – frozen products [Pres] * |
| – fish [MF] | – precut and washed fresh vegetables [Proc] |
| – fresh vegetables and fruit [FP] | – ready-to-eat meals [Proc] * |
| – milk products [FP] | – vitamin supplements [Proc] |
| – cheese [FP] * | |
| – bread products [FP] | |

Notes: All items were rated on 5-point scales. For all statements, respondents were given the opportunity to tick a ‘don’t know’ answer when they thought they were not able to provide a response. An asterisk indicates marker items.

^a Trust was measured for four different actors: the government, farmers, retailers, and food manufacturers.

^b The dimension to which each product group belonged is indicated between brackets, where [MF] refers to Meat and Fish, [FP] refers to Fresh Produce, [Pres] refers to Preserves, and [Proc] refers to processed foods.

Appendix B. Coding scheme hazards

Hazards	Category for further analysis	Media (total) ^a	Recall (total) ^b
Animal diseases			
avian influenza	avian influenza	964	155
BSE	BSE	129	91
blue tongue		49	8
pigs plague		29	46
foot and mouth disease		27	19
scrapie		1	0
animal diseases other / general		37	28
Genetic modification of food (crops)	GM	266	11
Contamination: Poisonous substances			
dioxins	dioxins	108	95
pesticide residues	pesticide residues	72	43
acrylamide		12	0
ricine		4	0
mycotoxins		2	0
poisonous substances other / general		55	28
Contamination: Microbiological contamination			
salmonella	microbiological	36	65
listeria	microbiological	2	0
e. coli	microbiological	5	1
campylobacter	microbiological	8	0
microbiological contamination other / general	microbiological	36	93
Contamination: other			
adulteration (e.g., glass, plastic, metal)	adulteration	12	110
sensory changes (e.g., taste, smell)		0	6
contamination of food products other / general		109	101
General violation hygiene / safety rules		12	56
Effect on health			
pathogenic / adverse effect		41	46
positive effect		26	0
effect on health general		8	0
Packaging		6	15
Product label: absent / incomplete		3	5
Other / not specified		28	317
Total		2087	1339
Total excluding other / not specified		2059	1022

^a Total number of articles.

^b Total number of times the category was mentioned by respondents.

Appendix C. Coding scheme product groups

Product group	Category for further analysis	Media (total) ^a	Recall (total) ^b
Meat and fish			
poultry, fowl	poultry	953	143
beef	beef	137	25
pork	pork	77	10
meat other / general		152	88
fish		35	22
Dairy			
milk, yogurt, custard	dairy	52	97
butter	dairy	0	2
cheese	cheese	11	46
dairy other / general	dairy	7	5
Eggs		28	7
Icecream		3	3
Vegetables and fruit			
fresh vegetables	fruit and vegetables	33	22
precut and washed fresh vegetables	fruit and vegetables	0	5
fresh fruits	fruit and vegetables	28	38
potatoes	fruit and vegetables	19	3
fresh vegetables, fruit, and potatoes other / general	fruit and vegetables	38	14
Grain, bread and bakery products		17	29
Soup, broth, sauces		4	2
Fats, oils		7	11
Herbs, spices		3	1
Nuts, salty snacks		7	6
Cocoa, coffee, tea			1
Confectionery, honey		7	2
Ready-to-eat meals		5	0
Products in jars		0	25
Products in cans		0	9
Baby food	baby food	19	81
Beverages			
Non-alcoholic beverages		23	16
Alcoholic beverages		4	6
Wine		0	4
Beverages other / general		0	2

Appendix C. Coding scheme product groups (continued)

Product group	Category for further analysis	Media (total)^a	Recall (total)^b
Diet food, food supplements, enriched food		2	0
Animal feed	animal feed	110	48
Other / not specified		306	566
Total		2087	1339
Total excluding other / not specified		1781	773

^a Total number of articles.

^b Total number of times the category was mentioned by respondents.

6

Consumer confidence in the safety of food in Canada and the Netherlands: The validation of a generic framework

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Abstract

A thorough understanding of consumer confidence in the safety of food and the factors by which this is influenced is necessary for the development of adequate and effective risk management and communication regarding food safety issues. As food chains become globalised, risk management and communication are increasingly applied at international levels. As a consequence, cross-culturally valid theoretical models are needed to investigate consumer confidence in the safety of food. In this study, consumer confidence in the safety of food in Canada and the Netherlands was systematically compared. On the basis of two nationally representative samples, it was examined to what extent differences in consumer confidence between the two countries resulted from differences in the relative importance of the determinants of confidence, and differences in the means of the constructs. No differences between Canada and

the Netherlands were found regarding the relative importance of the determinants, which provides support for the generalisability of the framework. However, results indicated that Dutch consumers had a higher level of optimism and a lower level of pessimism regarding the safety of food, which appeared to be mainly related to Dutch consumers' lower level of concern about factors related to production. The results also indicated cross-national differences in consumer recall of food safety issues in the media.

6.1 Introduction

In recent decades, consumers have been confronted with various food safety incidents, which have been associated with increased media attention focused on food safety issues. A well-documented example is provided by the case of Bovine Spongiform Encephalopathy (BSE) in cattle, which has had tremendous negative effects on the global economy (e.g., large-scale culling of animals, the enforcement of import bans, price fluctuations, as well as damage to the image of the industry) (Leiss & Nicol, 2006; Verbeke, Ward, & Avermaete, 2002; World Health Organization Europe, 2006). In addition, the BSE crisis has been associated with decreased consumer confidence in food risk management (Frewer & Salter, 2002). Another issue that received much media attention over the past years is the spread of the H5N1 Avian Influenza (AI) virus. Consumer fear of contracting the virus from consuming poultry has led to significant drops in the consumption level in a number of countries at the time the virus was spreading fast (Food and Agriculture Organization of the United Nations, 2006), although no epidemiological data suggest that the disease can be transmitted to humans through properly cooked food (World Health Organization, 2006). Appropriate risk management and risk communication practices are of key importance to minimise the negative effects associated with food-related hazards.

Potential health risks from food-related hazards are often not limited to individual countries as a result of increased internationalisation of trade, and multinational companies operating in more than one country. In addition, the potential of some hazards to cross international boundaries might be difficult to control. An example is provided by the spread of animal diseases, such as AI. Further, advances in information and communication technologies have resulted in increasingly rapid transmission of information around the globe. Increased accessibility of information to all interested actors across different countries, including consumers,

has resulted in food safety issues becoming an international affair. Trans-boundary risks, whether established or emerging, require a global approach and international collaboration regarding risk mitigation activities.

For adequate and effective risk management and communication in the light of food safety issues, a thorough understanding of consumer confidence in the safety of food and the factors by which this is influenced is needed. Insights into how consumer confidence in the safety of food changes over time in concordance with external food safety events can be used to evaluate the effectiveness of regulatory activities - including risk communication - which are designed to promote food safety, optimise consumer protection, and enhance consumer confidence in the safety of food. In addition, greater understanding of the factors that influence consumer confidence in the safety of food can be used to better take into account actual consumer concerns in communicating about food safety issues (Bruhn, 2005; Frewer, 2004). Therefore, theoretical models to investigate the factors that influence consumer confidence in the safety of food are needed that are cross-culturally valid (Steenkamp & Baumgartner, 1998).

In previous research, cross-national differences in consumer perceptions of risk, and confidence in food safety practices, have been examined in the context of food safety incidents (Berg, 2004; Pennings et al., 2002), newspaper reporting about risks (Rowe, Frewer, & Sjöberg, 2000), consumer perceptions of food risk management (Van Kleef et al., 2006), consumer trust in food (Berg et al., 2005; Poppe & Kjærnes, 2003), consumer perceptions of particular product groups (Henson & Northen, 2000), and consumer acceptance of new food technologies (Bredahl, 2001; Hornig Priest, Bonfadelli, & Rusanen, 2003). An important limitation of the survey studies among these investigations (Berg, 2004; Berg et al., 2005; Henson & Northen, 2000; Hornig Priest et al., 2003; Pennings et al., 2002; Poppe & Kjærnes, 2003) is that no assessment of measurement equivalence has been made (however, see Bredahl, 2001), although this is considered to be of great importance in the context of cross-national comparisons (Steenkamp & Baumgartner, 1998). Cross-national comparisons can only be made meaningfully when there is sufficient evidence that construct measures have the same content and meaning in different countries. When there is lack of such measurement equivalence, no meaningful comparisons can be made. Structural equation modelling (e.g., LISREL) provides a particularly appropriate and structured approach to test for cross-national measurement equivalence (Steenkamp & Baumgartner, 1998).

6.1.1 A framework of consumer confidence in the safety of food

Previous research has focused on consumer perceptions of specific food-related hazards (see, Kirk et al., 2002; Miles & Frewer, 2001), food safety incidents (see, Pennings et al., 2002; Setbon et al., 2005; Verbeke, 2001), and consumer acceptance of food technologies (see, Bredahl, 2001; Poortinga & Pidgeon, 2005). However, successive food scares, no matter how different in terms of risk characteristics and the degree of threat to public health, as well as more general consumer concerns about contemporary food production practices, may have the ability to put consumer confidence in the safety of food *in general* under pressure. Therefore, it is important to consider *general* consumer confidence in the safety of food, besides consumer perceptions related to the safety of particular product categories and specific food-related hazards, and to enhance insight into the factors that influence general consumer confidence in the safety of food. Hence, a framework of consumer confidence in the safety of food was developed in a previous study (De Jonge et al., 2007a), in which several factors related to general consumer confidence in the safety of food have been brought together. The concept of general consumer confidence in the safety of food, and the factors by which this might be influenced are outlined below.

General consumer confidence in the safety of food

General consumer confidence in the safety of food can be defined as the extent to which consumers perceive that food is generally safe. The concept of consumer confidence in the safety of food is not a one-dimensional construct, but can rather be conceptualised as consisting of two dimensions; optimism and pessimism (De Jonge et al., 2007a, 2007b). Optimism about the safety of food indicates the extent to which consumers are satisfied about the safety of food, and think that food is generally safe. Pessimism, on the other hand, indicates the extent to which consumers worry and are suspicious about the safety of food. In consumer perception, optimism and pessimism about the safety of food are not mutually exclusive: in other words, feelings of optimism and pessimism can coexist. That is, apart from having complete confidence in the safety of food (high optimism and low pessimism), or having no confidence in the safety of food at all (low optimism and high pessimism), consumers can simultaneously feel optimistic and pessimistic about the safety of food. The distinction between, and coexistence of, optimism and pessimism in the context of consumer confidence in the safety of food is in line with previous research, where similar distinctions have been identified between

positively and negatively oriented perceptions in the area of trust and distrust (Lewicki et al., 1998; Poortinga & Pidgeon, 2003), optimism and pessimism (Kubzansky et al., 2004), as well as positive and negative attitudes (Cacioppo et al., 1997; Conner & Sparks, 2002).

To conclude, optimism and pessimism should be considered as two related, but distinct, concepts that are not opposing dimensions of the same construct. In the framework of consumer confidence in the safety of food, optimism and pessimism are, therefore, included as two separate dependent variables.

Factors that may influence general consumer confidence

Recall

Confidence is typically lost when a consumer's expectations are disappointed (Kjærnes, 2006). When expectations are not met, for example after a food safety incident has occurred (Verbeke, 2001; Verbeke & Viaene, 1999), confidence in the safety of food might be reduced, particularly when there is also a perception of mismanagement on the part of the authorities or industries with responsibility for consumer protection (Washer, 2006). Therefore, consumer *recall* of specific food safety incidents and/or media coverage of food safety issues might reduce general consumer confidence in the safety of food.

Perceived product safety

General consumer confidence in the safety of food partly finds its basis in previous experiences and specific incidents that consumers have come across. Although food safety incidents typically do not involve the entire food production system, and pertain to potential risks associated with one or several particular product groups (e.g., beef), specific concerns at the product group level might negatively affect consumers' overall level of confidence in the safety of food. Therefore, consumer *safety perceptions of particular product groups* should be taken into account when investigating consumer confidence in the safety of food in general.

Concerns about food production

It has been suggested that general long term consumer *concerns about current food production practices* are responsible for low consumer confidence in the safety of food in general (Smith et al., 1999). Therefore, it was expected that the extent to which consumers are concerned about food production practices and the healthiness of food products available in the retail environment might influence their confidence in the safety of food in general.

Trust in institutions

In previous research, *consumer trust in institutions* that have a responsibility for guaranteeing food safety, such as farmers, retailers, manufacturers, and regulators has been identified as a factor that enhances consumer confidence in the safety of food (De Jonge, Van Trijp, Van der Lans, Renes, & Frewer, 2008b; Grunert, 2002). *Competence, honesty, and care for public well-being* are considered to be important aspects of trust (Frewer et al., 1996; Johnson, 1999; Kasperson et al., 1992; Metlay, 1999; Poortinga & Pidgeon, 2003; Renn & Levine, 1991).

Individual differences

Consumer confidence in the safety of food might be related to *individual differences*, such as socio-demographic and personality characteristics. In particular, the extent to which people tend to worry about things in general, a personality characteristic

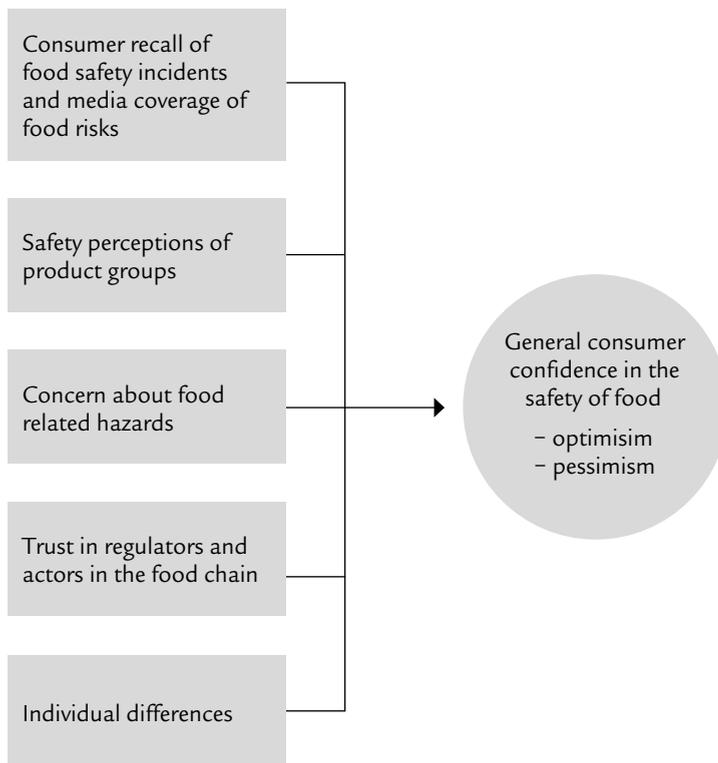


Figure 6.1 Framework of consumer confidence in the safety of food

Note: ‘Concern about food related hazards’ was not included in the framework that was originally developed in the Netherlands.

referred to as *trait worry* (Meyer et al., 1990), might provide insight into individual differences in consumer confidence in food safety.

The framework with optimism and pessimism as the two dependent variables, and the five factors as independent variables is displayed in Figure 6.1.

6.1.2 Aim of the study

In this study, it is investigated to what extent the research framework, originally developed in the Dutch context, can be applied to an international context. For that purpose, the Dutch situation is compared with the Canadian situation. Since 2003, Canada is facing severe consequences of the discovery of BSE in their herds (Leiss & Nicol, 2006). This provides an interesting background against which to assess the cross-national equivalence of the framework of consumer confidence in the safety of food.

Cross-national differences in consumer confidence in the safety of food are investigated regarding two distinct sources of differences. One source of differences lies in the relative importance of the determinants of confidence. That is, the pattern of significant effects, and/or the strength of the relationships between the determinants and general consumer confidence might differ between countries. Secondly, differences in the mean ratings on the constructs might be observed. For example, the level of consumer confidence in the safety of food might be significantly different between the two countries.

To summarise, the aim of this study is to examine the generalisability of the framework of consumer confidence in the safety of food to an international context. The extent to which consumer perceptions about the safety of food differ between Canada and the Netherlands, and to which source potential observed differences can be attributed, will be investigated. In addition, a more in-depth exploration of consumer recall of food safety issues in the media is performed, in order to relate potential cross-national differences in consumer confidence in the safety of food to country differences in consumer exposure to food safety information.

6.2 Method

6.2.1 Data collection and samples

A cross-sectional survey was conducted in the two countries by a professional market research agency. In both countries, participants were recruited from a panel of individuals who had volunteered to take part in survey studies. Data collection

took place in November/December 2005 (The Netherlands) and in June 2006 (Canada). The target population was residents of Canada and the Netherlands of 16 years of age or older. In Canada, French speaking respondents were excluded from participation. Quota sampling was performed on the basis of gender, age, education level, household size, and area of residence. The survey was filled out by respondents on the Internet. In total, 1136 respondents completed the questionnaire, of which 528 were Canadian and 608 were Dutch (see Table 6.1). The response rate in respectively Canada and the Netherlands was 53% and 49%. The

Table 6.1 Sample characteristics

Characteristic	Canada (N = 528)		Netherlands (N = 608)	
	%	#	%	#
<i>Gender</i>				
Male	47.3	250	54.3	330
Female	52.7	278	45.7	278
<i>Age</i>				
15-19	7.4	39	7.6	46
20-24	8.1	43	6.4	39
25-29	8.5	45	10.0	61
30-39	16.7	88	21.1	128
40-49	20.1	106	18.8	114
50-64	22.3	118	20.7	126
65+	16.9	89	15.5	94
<i>Education level</i>				
Low	32.6	172	25.2	153
Average	34.7	183	37.3	227
High	32.8	173	37.5	228
<i>Number of children</i>				
0	68.6	362	64.3	391
1	17.0	90	16.1	98
2	9.7	51	14.1	86
3	4.7	25	5.4	33
<i>Allergic</i>				
Yes	25.4	134	18.8	114
No	74.6	394	81.3	494

composition of the samples regarding gender, age, and education level was compared with population characteristics on these variables. There was a slight overrepresentation of higher educated respondents in both countries. The results of this study can be regarded approximately representative for the population of persons of 16 years and older in respectively the Netherlands and the English speaking parts of Canada.

6.2.2 Materials

The items that were used to measure consumer confidence in the safety of food and its determinants are provided in the Appendix. On the basis of previous research (De Jonge et al., 2007a), general consumer confidence in the safety of food was operationalised as consisting of two distinct dimensions, i.e. *optimism* (4 items) and *pessimism* (3 items). Regarding consumer recall of food safety incidents and messages in the media about food safety, a distinction was made between respondents who recalled an incident and/or messages in the media about an incident (1), and respondents who did not recall either food safety incidents or messages in the media (0). In addition, respondents who indicated to recall news messages were asked what the recalled message was about. Consumer confidence in the safety of a broad range of 18 different product groups, which are part of the daily nutrition of many consumers, was assessed. Exploratory factor analysis was performed on the data sets of both countries separately to examine the underlying dimensional structure of the range of product groups. 'Baby food' was omitted from the analysis, because more than 20% of the respondents in both the Netherlands and Canada did not indicate to what extent they perceived products in this category to be safe. In addition, over 20% of Dutch, and over 15% of Canadian consumers, did not respond to the item regarding 'meat replacers', and this category was therefore similarly omitted from further analysis. Three dimensions had eigen values over 1. 'Vitamin supplements' and 'precut and washed vegetables' were not included in the final scales, because for the Dutch data these had, respectively, a low communality (< 0.50) and a low factor loading (< 0.50) (see Hair, Anderson, Tatham, & Black, 1998; Sharma, 1996). The dimensions were labelled 'meat and fish' (4 items), 'fresh produce' (5 items), and 'preserves and processed foods' (5 items). In total, the three dimensions explained about 70% of the variance. Consumer concerns about 17 food-related hazards were assessed, and the underlying dimensional structure of these hazards was examined through exploratory factor analysis. Two dimensions had eigen values over 1. Four items were removed from the scale because of low communalities and/or factor loadings (see

the Appendix). The extracted dimensions were identified as 'production method related' (10 items), and 'health related' (3 items) hazards, and together explained about 70% of the variance. Trust was measured using six items for each of four different actors (the government, farmers, retailers, food manufacturers). The items represented the extent to which the actor was perceived to be competent, to be honest and open, and to care for public well-being with respect to food safety matters (see Frewer et al., 1996; Lang & Hallman, 2005; Metlay, 1999; Poortinga & Pidgeon, 2003). Trait worry was measured on a three-item scale using items from the Penn State Worry Questionnaire (Brown, 2003). Demographic and background characteristics, such as age, gender, education level, whether respondents took care of children, and whether respondents had household experience of food allergy, were included as potential determinants of consumer confidence in the safety of food.

6.2.3 Data Analysis

The cross-national validation of the framework of consumer confidence in the safety of food was performed through structural equation modelling, using LISREL 8.72. Model fit was assessed on the basis of the χ^2 , the Root Mean Square Error of Approximation (RMSEA), and the Comparative Fit Index (CFI). Values of RMSEA should ideally be below 0.05 (good fit), but values up till 0.08 are considered acceptable (Baumgartner & Homburg, 1996). Regarding CFI, which ranges from 0 to 1, values ≥ 0.97 indicate a good model fit (Schermelleh-Engel et al., 2003). In addition, the Consistent Akaike Information Criterion (CAIC) adjusts for model parsimony, and was used to compare alternative models. Lower values of CAIC indicate better model fit. Maximum likelihood was used for model estimation, using covariances as input for the analysis. To identify the model, the factor loading of one item per construct was set to one, and the intercept of the same item was fixed to zero. These items are referred to as marker items. The same items for each construct were used as marker items in both countries.

Following Steenkamp and Baumgartner (1998), the cross-national validity of the framework of consumer confidence in the safety of food was established in four steps. First, the model was estimated for each country separately. These baseline models provide insight into the fit of the model to the data, as well as the validity of the measures, within a particular country. Second, it was assessed whether the measures of the constructs had the same content and item structure in both countries (i.e., measurement equivalence). In the third step, it was established whether the structural model was identical between the two countries as evidenced by the

relative importance of the determinants in explaining general consumer confidence in the safety of food. In addition, cross-national differences regarding the strength of the relationships were investigated. In the fourth step it was identified whether the mean scores on the constructs differed between the countries, and to what extent between-country differences existed in consumer perceptions of the safety of food and its determinants. Each of these steps will be discussed in more detail below.

Step 1: Convergent and discriminant validity of the baseline measurement models of both countries were assessed on the basis of (1) the average variance extracted (AVE) of the constructs, which should be > 0.50 (Fornell & Larcker, 1981), (2) an examination of AVE compared to the squared correlations between the constructs, where AVE should be greater than the squared correlations (Fornell & Larcker, 1981), and (3) the size of the correlations between the constructs, which should be smaller than 1 (Anderson & Gerbing, 1988). Respondents with missing values on any of the included items were excluded⁶. Establishing baseline measurement models for the two countries separately was conducted to give insight into the validity of the measures in a national context, and to have a first indication of the applicability of the framework in both countries.

Step 2: Multi-group confirmatory factor analysis was applied to cross-validate the factorial structure of the measurement model (see, for example, Byrne, 1998). When the measures of the constructs are cross-nationally equivalent, meaningful comparisons can be made regarding the relationships between the constructs and the mean scores on the constructs. Measurement equivalence was assessed in several steps (see, for example, Koufteros & Marcoulides, 2006; Steenkamp & Baumgartner, 1998), and established on the basis of the change in overall model fit, as well as the modification indices (MI). Consecutively, configural, metric, scalar, and factor variance invariance were imposed on the model. When configural and metric equivalence hold, this means that the same underlying constructs are measured in the countries under investigation, and that consumers respond to the observed items in the same way. When, in addition, scalar invariance holds,

6 The disadvantage of listwise deletion is loss of information, as the number of respondents without any missing values was substantially smaller than the total sample size. However, two-way data imputation, which takes into account a respondent's answers to other items of the same measurement construct, as well as other respondents' answers to the particular item (see Sijtsma & Van der Ark, 2003), can only be applied when the validity of the measurement model has been established. Therefore, the development of the measurement model, and the assessment of measurement equivalence was done on the basis of complete data (Canada: $n = 301$ (57%); The Netherlands: $n = 441$ (73%)). However, in order to reduce the loss of information that results from listwise deletion, two-way imputation was applied to estimate missing values on the basis of the validated measurement scales. The imputed data were used to estimate the structural model and country differences in construct means.

cross-national differences can be assessed regarding the mean scores on the constructs. Factor variance invariance is required to make cross-national comparisons of structural regression coefficients.

Step 3: On the basis of the validated measurement model, missing observations were estimated by means of two-way imputation (Sijtsma & Van der Ark, 2003). Missing values were imputed for respondents who had less than 10% missing responses (i.e., maximum 6 missing values out of 61 items in total), and who had responded to at least one item within every construct. The influence of the determinants on optimism and pessimism was assessed by estimating all paths from the determinants to both optimism and pessimism. The structural model was first estimated without any invariance constraints imposed on the structural parameters, i.e., the structural regression coefficients were estimated freely for each country. In addition, the covariance between optimism and pessimism was set free in both countries. Subsequently, all structural coefficients were constrained to be equal across the two countries, as well as the covariance between optimism and pessimism, in order to investigate whether the relationships between the constructs were equivalent in the two countries.

Step 4: The mean scores on the constructs were estimated for both countries to make cross-national comparisons of consumer perceptions of food safety. Remember that, to identify the model, the intercept of one item of each construct (marker item) was fixed to zero, and that the loading of this item was fixed to one. The estimation of the construct means are dependent upon which item is used as the marker item. That is, the scale of the construct mean is set to be equivalent to that of the chosen marker item. As such, the absolute values of the construct means should not be considered as 'true' scale values. The estimated mean scores are only useful for comparing construct means between the two countries.

6.3 Results

6.3.1 Measurement model

For both countries all multi-item measures performed well, with the exception of the six-item measure of trust. Results indicated that for each of four different actors the two competence items did not perform well on the trust measure for the Canadian data. The competence items in the Canadian dataset showed relatively low correlations with the other trust items, and these items had very low explained variance. Consequently, the competence items were separated from the other trust items for each actor, and included in the model as separate constructs. That is, two

constructs were included for each actor: the extent to which the actor was believed to be competent, and the degree to which the actor was considered open and concerned about public welfare. This was done within both countries, as further model comparisons can only be performed when the underlying measurement model is similar for both countries. Including perceived competence in the measurement model as a separate construct (for each actor), resulted in good fit statistics for both countries. Although the Chi-squared test was significant, χ^2 (1649) = 3137.2 (Dutch data) and 3011.5 (Canadian data), other goodness-of-fit measures were all satisfactory (RMSEA = 0.0481/0.0542; CFI = 0.983/0.971 for respectively the Dutch and the Canadian model). In addition, all factor loadings were significant, and the composite reliabilities of each construct exceeded 0.70. The AVE of the constructs exceeded 0.50 for both countries, which shows convergent validity (Fornell & Larcker, 1981). In addition, with two exceptions regarding the Dutch data, the AVE of each construct exceeded the squared correlation between that particular construct and each of the other constructs, which is an indication of discriminant validity (Fornell & Larcker, 1981). All correlations were significantly smaller than 1 for both countries, providing further support for discriminant validity (Anderson & Gerbing, 1988; Fornell & Larcker, 1981). For the Dutch data, however, the decoupled constructs of competence and trust were highly correlated, particularly for the government and retailers. The squared correlations were respectively equal to, and larger than, the AVE of these constructs. In sum, the results from the baseline models indicate that the framework of consumer confidence in the safety of food is applicable to both countries. However, in order to be able to make cross-national comparisons regarding the relationships between the constructs and the construct mean scores, a more rigid test of the equivalence of the measures has to be established.

6.3.2 Measurement equivalence

The results of the sequential constraints that were imposed on the measurement model are shown in Table 6.2. Some of the factor loadings and item intercepts were not invariant across the two countries. Relaxing the invariance constraints on three loadings and seven item intercepts resulted in partial scalar invariance. It should be noted that one of the unconstrained loadings was part of a two-item measure (competence manufacturers). Although the lack of invariance of this factor loading was modest (MI = 11.8), given that at least one item besides the marker item has to have invariant factor loadings and intercepts in order to meaningfully compare construct means (Steenkamp & Baumgartner, 1998), the perceived competence of

Table 6.2 Assessment of measurement equivalence

	χ^2	<i>df</i>	RMSEA	CFI	CAIC	$\Delta\chi^2$	Δdf	<i>p</i>
Configural invariance	6148.7	3298	0.051	0.979	11042.2			
Full metric invariance	6243.1	3343	0.051	0.979	10798.8	94.4	45	<0.01
Final partial metric invariance	6205.6	3340	0.051	0.979	10784.6	56.9	42	0.062
Initial scalar invariance	6777.7	3398	0.055	0.975	10995.8	572.1	58	<0.01
Final partial scalar invariance	6592.7	3394	0.053	0.977	10763.0	387.1	54	<0.01
Full factor variance invariance	6639.9	3410	0.053	0.976	10710.4	47.2	16	<0.01
Final partial factor variance invariance	6624.5	3409	0.053	0.976	10694.1	31.8	15	<0.01

manufacturers should not be compared cross-nationally. Finally, constraints were imposed on the factor variances. CAIC of the partial factor variance invariance model was the lowest CAIC of all models, indicating that this model showed good fit to the data.

It can be concluded that the subsequent models of invariance fitted the data well. Therefore, there is reasonable evidence to support measurement equivalence for the Canadian and the Dutch data. This means that the same underlying constructs are present in the two countries, and that country differences regarding the relationships among the theoretical constructs as well as the means of the constructs can meaningfully be compared.

6.3.3 Structural model: The relative importance of the determinants

Imputation of the missing values resulted in a sample size of 573 for the Dutch sample (94%) and 478 for the Canadian sample (91%). The structural model was first estimated without any invariance constraints imposed on the structural parameters. The decoupling of the competence aspect from the openness and care aspect of trust resulted in multi-collinearity problems for the Dutch data. That is, in the Netherlands, competence was strongly related to perceptions of honesty and care. As the one-dimensional operationalisation of trust did not fit the Canadian data (see section 6.3.1), and the decoupled approach where competence was

included as a separate construct did not suit the Dutch data, perceived competence was excluded from the structural model⁷.

The model where the structural parameters were freely estimated across the two countries yielded a good overall fit: $\chi^2 (3186) = 6629.8$ ($p < 0.01$), RMSEA = 0.05, CFI = 0.98, CAIC = 9927.0. Subsequently, all structural coefficients were constrained to be equal across the two countries, as well as the covariance between optimism and pessimism. This resulted in a significant deterioration of the model ($\Delta\chi^2 (33) = 53.9$, $p = 0.0123$). The largest modification index (10.2) indicated that the covariance between optimism and pessimism was not invariant for the Netherlands and Canada. Relaxing this constraint yielded a significant improvement in fit compared to the constrained model ($\Delta\chi^2 (1) = 13.8$, $p < 0.001$). In addition, the fit of this model was not significantly worse than the fit of the model with unconstrained structural coefficients ($\Delta\chi^2 (32) = 40.1$, $p = 0.15$), and had a lower CAIC (9713.2). Optimism and pessimism were more strongly correlated in the Netherlands (-0.71), in comparison to Canada (-0.59). The modification indices did not indicate that substantial model improvements could be obtained by relaxing any of the structural coefficients. This means that the relative importance of the determinants is the same for Canada and the Netherlands.

The standardised regression coefficients are displayed in Table 6.3. In total, the independent variables explained 61% of the variance in optimism, and 51% of the variance in pessimism. Trust in actors who have a shared responsibility for the safety of food was strongly related to general consumer confidence in the safety of food, in particular to general optimism. In addition, consumer confidence in the safety of specific product groups was related to their general level of confidence in the safety of food, although this was not the case for confidence in the safety of fresh products. Also consumer concerns about production method related issues were significantly related to both optimism and pessimism about the safety of food. Although the effect was relatively modest, consumer recall of food safety incidents, and/or media coverage of food safety issues, was significantly related to both optimism and pessimism about the safety of food. The personality characteristic trait worry was also significantly related to optimism and pessimism, indicating that the more people tend to worry in general, the less optimistic and the more pessimistic they are about the safety of food. With respect to the background vari-

⁷ It might be noted here that separate analyses for the two countries indicated that excluding perceived competence from the model did not influence the pattern of significant relationships. That is, regarding the Canadian data, the competence constructs were not significantly related to optimism and pessimism. In addition, for the Dutch data the 6-item trust construct (including perceived competence) and the 4-item trust construct (excluding perceived competence) resulted in the same significant effects on optimism and pessimism.

Table 6.3 Standardised regression coefficients ($N = 1051$, of which 478 Canadian and 573 Dutch)

	Optimism		Pessimism	
	Beta	<i>t</i>	Beta	<i>t</i>
Trust in the government	0.15	4.35	-0.02	-0.64
Trust in farmers	0.11	3.82	0.00	0.08
Trust in retailers	0.13	3.83	-0.01	-0.19
Trust in food manufacturers	0.22	5.51	-0.18	-4.08
Perceived safety meat and fish	0.14	3.05	-0.18	-3.58
Perceived safety fresh	0.08	1.75	0.03	0.61
Perceived safety preserved and processed	0.11	2.49	-0.10	-2.03
Production-related concerns	-0.18	-4.07	0.39	7.72
Health-related concerns	0.05	1.13	-0.06	-1.12
Recall	-0.07	-2.87	0.07	2.71
Trait worry	-0.06	-2.18	0.21	7.14
Age	0.02	0.83	0.00	0.15
Gender	-0.01	-0.31	-0.01	-0.37
Kids	0.00	0.07	0.01	0.34
Education	0.01	0.41	-0.08	-2.87
Allergic	-0.01	-0.41	0.03	0.99

Note: Based on two-tailed tests: for t -values > 1.96 , $p < 0.05$; for t -values > 2.58 , $p < 0.01$. Significant coefficients are in bold.

ables only a significant effect for education on pessimism was found. More highly educated consumers tended to be less pessimistic about the safety of food compared to less educated consumers.

6.3.4 Comparing construct means

A comparison of the construct means across Canada and the Netherlands indicated some significant differences (see Table 6.4). Canadian consumers seemed to be less confident about the safety of food in general than Dutch consumers. That is,

Table 6.4 Comparison of the construct means (SE)

Construct	M (SE)		p-value
	Canada (N = 478)	The Netherlands (N = 573)	
Optimism	3.34 (0.04)	3.50 (0.03)	<0.01
Pessimism	3.10 (0.05)	2.72 (0.04)	<0.01
Competence government	3.84 (0.04)	3.48 (0.04)	<0.01
Competence farmers	3.66 (0.04)	3.65 (0.03)	NS
Competence retailers	3.40 (0.04)	3.20 (0.04)	<0.01
Competence manufacturers ^a	3.94 (0.04)	3.93 (0.03)	NS
Trust in the government	3.20 (0.05)	3.13 (0.04)	NS
Trust in farmers	3.41 (0.04)	3.17 (0.03)	<0.01
Trust in retailers	2.94 (0.04)	2.89 (0.03)	NS
Trust in manufacturers	3.08 (0.04)	3.08 (0.03)	NS
Perceived safety meat and fish	3.48 (0.05)	3.58 (0.04)	NS
Perceived safety fresh	3.97 (0.03)	4.04 (0.03)	NS
Perceived safety preserves and processed	3.71 (0.04)	3.80 (0.04)	NS
Production-related concerns	4.04 (0.05)	3.45 (0.05)	<0.01
Health-related concerns	3.81 (0.05)	2.95 (0.05)	<0.01
Trait worry	2.21 (0.05)	1.94 (0.04)	<0.01

Note: ^a Construct mean comparisons should be made with caution, because one of the items of this two-item construct was not metric and scalar invariant.

they were less optimistic and more pessimistic than their Dutch counterparts. The lower level of general confidence was not reflected by Canadian consumers' confidence in the safety of product groups, but the results did indicate that Canadians seemed more concerned about *production* and health related issues ($p < 0.01$) compared to Dutch consumers. With respect to trust in the four food-chain actors, trust in farmers was significantly higher in Canada than in the Netherlands ($p < 0.01$). The perceived competence of the government and retailers was also higher in Canada ($p < 0.01$). Finally, Canadian consumers reported a significantly higher level of trait worry ($p < 0.01$).

6.3.5 Cross-national differences in consumer recall of food safety issues in the news

The number of consumers who indicated to recall food safety incidents and/or associated media attention (43% Canada; 45% The Netherlands), as well as the *impact* of recall on optimism and pessimism, did not differ between the two countries. However, cross-national differences emerged regarding *what* people indicated to recall. That is, consumer recall of media coverage of food safety issues was related to specific product groups and hazard types (see Table 6.5). In both countries, most recollections related to meat. However, in Canada *beef* issues were more prominently recalled, whereas in the Netherlands *poultry* issues were more dominant ($\chi^2(3, n = 287) = 60.55, p < 0.01$). The most frequently mentioned hazard in relation to recalled messages about beef was *BSE*, and for poultry this was *AI*. So, it appears that BSE issues were more salient in Canada, and AI was a bigger issue in the Netherlands at the time of data collection.

Table 6.5 Consumer recall of media coverage of food safety issues

	Canada	The Netherlands
Beef	39% (of which 85% BSE)	5% (of which 56% BSE)
Poultry	23% (of which 85% AI)	58% (of which 72% AI)
Other type of meat or fish	4%	6%
Other product category or not indicated	34%	31%
Total	100%	100%

An investigation of the pattern of identified BSE cases in both countries (see Table 6.6) shows that the annual number of cases (although limited) is still increasing in Canada, which might explain why BSE is more often recalled as being in the news. Regarding AI, both countries experienced a large-impact event. In the Netherlands over 30 million birds were culled in 2003, many as a precautionary measure, when the H7N7 virus was found in birds. In Canada high pathogenic H7 was found in British Columbia's Fraser Valley in early 2004. Forty two commercial and eleven backyard premises were depopulated, and in the surrounding area, birds were preemptively destroyed. More recently, AI has been in the news worldwide in relation to the spread of the H5N1 virus from Asia to other countries, including several European countries, in the second half of 2005 and early 2006. In addition, by the end of 2005 the first human casualties in Asia were reported. Although no H5N1-infected

animals have been found in the Netherlands, the higher level of consumer recall of AI news messages might result from the fact that the Netherlands was physically closer to the countries with identified cases of H₅N₁ in wild birds than Canada, or because there were no ‘competing’ food safety issues in the news media.

Table 6.6 The number of identified BSE cases in Canada, the Netherlands, and the UK

	Canada	The Netherlands	UK
1996 and before	1 ^a	0	169473
1997	0	2	4393
1998	0	2	3235
1999	0	2	2301
2000	0	2	1443
2001	0	20	1202
2002	0	24	1144
2003	2 ^b	19	611
2004	1	6	343
2005	1	3	225
2006	5	2	114

Note: Reproduced from World Organization of Animal Health (OIE).

^a Imported case

^b One case diagnosed in Canada in May 2003, and one case diagnosed in the United States of America in December 2003 and confirmed as having been imported from Canada.

Given the cross-national differences regarding the issues that were recalled, it is interesting to examine to what extent consumer confidence in the safety of beef and poultry is different in Canada and the Netherlands. It might be expected that Canadian consumers have less favourable perceptions of beef, compared to Dutch consumers. Further, Dutch consumers might have less favourable perceptions of poultry, compared to Canadian consumers. A comparison of both countries (including both consumers who did, and who did not, recall food safety messages in the news) indicated significant differences for both beef and poultry (see Table 6.7). Dutch consumers had more confidence in beef, whereas Canadian consumers had more confidence in the safety of poultry.

Table 6.7 Consumer confidence in the safety of beef and poultry

	Canada (N = 478)	The Netherlands (N = 573)	p
Beef	3.54	3.71	<0.01
Poultry	3.39	3.04	<0.01

6.4 Discussion and implications

The aim of this study was to cross-validate the framework of consumer confidence in the safety of food to an international context. The results of the study provide support for the generalisability of the framework, which means that the analytical framework is suitable for the investigation of consumer perceptions of food safety in an international context.

With respect to the relative importance of the determinants of general consumer confidence, no differences between Canada and the Netherlands were found. However, results indicated that optimism and pessimism were more strongly negatively correlated in the Netherlands than in Canada. It is possible that, if a food safety incident occurs, information processing occurs more systematically, such that optimism and pessimism become 'decoupled'. This is similar to the inverse relationship between perceived risk and benefit, which is stronger when heuristic processing occurs (Finucane, Alhakami, Slovic, & Johnson, 2000b). However, further research is needed to investigate whether this is indeed the case.

With respect to the mean scores on the constructs some significant differences between Canada and the Netherlands were observed. The results indicated that Dutch consumers had a higher level of optimism and a lower level of pessimism regarding the safety of food. From the model it appears that the difference in general consumer confidence in the safety of food might be related to the lower level of concern about *production method* related issues expressed by Dutch consumers. This raises the question of why Dutch consumers are less concerned about these issues than their Canadian counterparts. Considering the mean ratings of trust and perceived competence regarding the different actors, the lower level of concerns about production method related issues does not seem to stem from a higher level of trust in food chain actors and regulators. That is, public trust in farmers, as well as the perceived competence of the government and retailers, was slightly higher in Canada as compared to the Netherlands. Further research is needed to better understand the different levels of concern about production method related issues in Canada and The Netherlands.

Although no differences were found in the *extent* of consumer recollection of food safety incidents and associated media coverage, cross-national differences emerged regarding the *kind* of incidents recalled. That is, Canadian consumers more often reported to recall beef related issues, whereas Dutch consumers more often mentioned poultry in relation to food safety incidents. However, the *impact* of recall on consumer optimism and pessimism about the safety of food was not affected by this, as the strength of the relationship with optimism and pessimism

was equivalent in the two countries. Compared to some of the other determinants of consumer confidence, such as trust in different actors in the food chain and the perceived safety of product groups, the explanatory power of recall was limited. This may have partly been due to the relatively simple and one-dimensional measure that was applied to measure consumer recall of food safety incidents. Previous research has shown that the extent to which consumer perceptions about food safety are affected by the occurrence of incidents and media coverage is dependent upon several factors (Kasperson et al., 1988; Frewer et al., 2002; Loewenstein et al., 2001). For example, the *amount* of information disseminated, disagreement between various actors in the risk debate, dramatisation of risk information, and the way in which the message is communicated can intensify public perceptions of risk and concern (Kasperson et al., 1988). In addition, public trust in regulators (Frewer et al., 2002), and the availability of vivid images of a particular incident (Loewenstein et al., 2001) are likely to influence the impact of food safety issues on consumer confidence. *Actual* media coverage on food safety issues and risk communication directed at consumers, and specific characteristics of information dissemination, has not been investigated in the two countries under consideration. That is, a subjective measure of news media coverage was used in this study to assess the impact of food safety incidents on consumer confidence in the safety of food, namely consumer *recall* of media reporting associated with food safety. However, information about actual media coverage may provide more insight into why some incidents have a more substantial impact on general consumer confidence in the safety of food than others. Therefore, a venue for future research could be to investigate how different characteristics of actual media coverage of food safety issues influence consumer perceptions about food safety.

Although the framework was suitable for both countries, the trust construct could not be conceptualised in the same way for both countries with respect to perceived competence. The discussion about the dimensionality of trust is an ongoing debate in social science, but competence is generally agreed to contribute to trust in both information sources, and institutions charged with responsibility for consumer protection (Frewer et al., 1996; Johnson, 1999; Kasperson et al., 1992; Metlay, 1999; Poortinga & Pidgeon, 2003; Renn & Levine, 1991; Siegrist et al., 2003; Van Kleef et al., 2006). Although Canadian consumers appear to perceive that the different actors are competent regarding their ability to control and guarantee the safety of food, perceived competence is only moderately related to perceptions of honesty and care. Apparently, being knowledgeable does not mean that one can be trusted (see also Frewer et al., 1996; Van Kleef et al., 2006). Perhaps a new dimension to the discussion about the concept and dimensionality of trust would be the

hypothesis that the relevant dimensions of the trust construct exhibit true cross-national differences, such that consumers distinguish between different dimensions of trust according to culturally determined factors, perhaps as a consequence of different historical precedents occurring in the context of risk management, which influence consumer responses to different risk issues (see Van Kleef et al., 2007). This might usefully be explored in further research.

In the present study, the personality characteristic 'trait worry' was significantly related to both the optimism and the pessimism dimension of consumer confidence in the safety of food, and found to be more important in explaining differences in general consumer confidence as compared to socio-demographic variables. In future studies, consumer differences regarding their food-related lifestyle (see Scholderer, Brunsø, Bredahl, & Grunert, 2004), or food-related personality traits (see Eertmans, Victoir, Vansant, & Van den Berg, 2005), such as food involvement (Marshall & Bell, 2004) and food neophobia (Ritchey, Frank, Hursti, & Tuorila, 2003), could be investigated to obtain more insights into individual differences regarding food safety perceptions.

A limitation of this study is that on the basis of this analysis no inferences can be made regarding causal processes underlying more *specific* (e.g., trust in institutions and the perceived safety of product groups) and *general* consumer perceptions of food safety (i.e., optimism and pessimism). On the basis of theoretical arguments, it was imposed on the model that general consumer optimism and pessimism about the safety of food are influenced by more specific consumer perceptions about food safety-related issues, such as their level of trust in different actors, rather than the other way around. Previous research has addressed the issue whether specific trust drives general attitudes associated with a particular hazard or vice versa, and the results were mixed (Eiser, Miles, & Frewer, 2002; Poortinga & Pidgeon, 2005). More insight into causal processes underlying the relationship between *specific* and *general* consumer perceptions of food safety remains a topic for further research.

To conclude, the results of this study indicate that the framework of consumer confidence is applicable to an international context. The measurement constructs can be conceptualised in the same way across countries, and the structural relationships between the constructs show equivalence. However, the validation process should be further extended. Future research could focus on other countries, particularly countries that are culturally different from Canada and the Netherlands. That is, Canada and the Netherlands are relatively similar in terms of the four dimensions of national culture, viz. *power distance*, *uncertainty avoidance*, *individualism-collectivism*, and *masculinity-femininity*, as described by Hofstede (2001).

Therefore, the applicability of the framework in countries that are more culturally diverse could be examined in order to obtain more insight into whether risk communication and management practices can be standardised across countries, or whether cultural or national differences need to be taken into account explicitly (see also Van Dijk et al., 2008; Van Kleef et al., 2007).

Appendix. Questionnaire items

Questionnaire items

Optimism (strongly agree - strongly disagree)

- I am optimistic about the safety of food products
- I am confident that food products are safe
- I am satisfied with the safety of food products
- Generally, food products are safe

Pessimism (strongly agree – strongly disagree)

- I worry about the safety of food
- I feel uncomfortable regarding the safety of food
- As a result of the occurrence of food safety incidents I am suspicious about certain food products

Recall (yes/no [first two items]; open-ended question [last item])

- Do you recall a particular incident over the past six months where the safety of food was compromised or threatened?
- Have you seen, heard, or read any news messages in the media over the past six months about an actual food safety incident?
- What was the message about?

Safety of product groups (no confidence at all – complete confidence)

- How much confidence do you, generally, have in the safety of the following product groups?^a
- | | |
|-------------------------------------|---|
| – beef [MF] | – precut and washed fresh vegetables [NI] |
| – pork [MF] | – milk products [FP] |
| – poultry [MF] | – cheese [FP] |
| – fish [MF] | – eggs [FP] |
| – meat replacers / substitutes [NI] | – bread products [FP] |
| – baby food [NI] | – frozen products [PP] |
| – products in cans [PP] | – ready-to-eat meals [PP] |
| – products in jars [PP] | – vitamin supplements [NI] |
| – fresh vegetables and fruit [FP] | – confectionery products [PP] |

Appendix. Questionnaire items (continued)

Questionnaire items

Concern about food-related hazards (not at all concerned – very much concerned)

To what extent are you concerned about the following issues?^b

- the use of additives [PM]
- the feed given to livestock [PM]
- genetically modified foods [PM]
- conditions in which food animals are raised [NI]
- the amount of salt in food [H]
- hormones in meat [PM]
- the use of pesticides in agriculture [PM]
- bacteria and viruses that can cause food infections [PM]
- the quality of information on product labels [NI]
- animal diseases [PM]
- the amount of fat in food [H]
- food allergies [NI]
- the origin of products / animals [PM]
- the amount of sugar in food [H]
- antibiotics in meat [PM]
- healthy eating [NI]
- BSE and Creutzfeldt-Jakob Disease (vCJD) [PM]

Trust^c (strongly agree – strongly disagree)

- [actor] has / have the competence to control the safety of food
- [actor] has / have sufficient knowledge to guarantee the safety of food products
- [actor] is / are honest about the safety of food
- [actor] is / are sufficiently open about the safety of food
- [actor] takes / take good care of the safety of our food
- [actor] gives / give special attention to the safety of food

Trait worry (not at all typical – very typical)

- Many situations make me worry
- I know I shouldn't worry about things, but I just cannot help it
- I notice that I have been worrying about things

Notes: All items were rated on 5-point scales. For all statements, respondents were given the opportunity to tick a 'don't know' answer when they thought they were not able to provide a response.

^a The dimension to which each product group belonged is indicated between brackets, where [MF] refers to Meat and Fish, [FP] refers to Fresh Produce, and [PP] refers to Preserves and Processed foods. [NI] refers to Not Included.

^b The dimension to which each hazards belonged is indicated between brackets, where [PM] refers to Production Method, and [H] refers to Health. [NI] refers to Not Included.

^c Trust was measured for four different actors: the government, farmers, retailers, and food manufacturers.

How trust in institutions and organisations builds general consumer confidence in the safety of food: A decomposition of effects

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Abstract

This paper investigates the relationship between general consumer confidence in the safety of food and consumer trust in institutions and organisations. More specifically, using a decompositional regression analysis approach, the extent to which the strength of the relationship between trust and general confidence is dependent upon a particular food chain actor (for example, food manufacturers) is assessed. In addition, the impact of specific subdimensions of trust, such as openness, on consumer confidence are analysed, as well as interaction effects of actors and subdimensions of trust. The results confirm previous findings, which indicate that a higher level of trust is associated with a higher level of confidence. However, the results from the current study extend on previous findings by disentangling the effects that determine the strength of this relation-

ship into specific components associated with the different actors, the different trust dimensions, and specific combinations of actors and trust dimensions. The results show that trust in food manufacturers influences general confidence more than trust in other food chain actors, and that care is the most important trust dimension. However, the contribution of a particular trust dimension in enhancing general confidence is actor-specific, suggesting that different actors should focus on different trust dimensions when the purpose is to enhance consumer confidence in food safety. Implications for the development of communication strategies that are designed to regain or maintain consumer confidence in the safety of food are discussed.

7.1 Introduction

As a result of the complexity of the food production system, consumers have to rely on actors in the food chain to provide safe food. Conferring trust onto actors in the food chain, such as farmers, retailers and manufacturers, as well as trust in regulatory authorities enables consumers to compensate for the lack of knowledge they have about the cultivation and production process of foods (Berg, 2004; Green et al., 2003; Siegrist & Cvetkovich, 2000; Van Kleef et al., 2006). It has been suggested that consumer trust in producers and distributors responsible for the management of hazards, may be an important driver of general consumer confidence in the safety of food (Berg et al., 2005; Brunel & Pichon, 2004; Grunert, 2002). Also, new regulatory institutions have been installed in Europe (Halkier & Holm, 2006), which aim to maintain and enhance consumer confidence in the safety of food.

Although stakeholders share the responsibility of guaranteeing safe food (Bergeaud-Blackler & Ferretti, 2006), different actors play different roles. Previous research has indicated that some actors in the field of food production and technology are more trusted than others (Frewer & Miles, 2003; Lang & Hallman, 2005). Besides differences between actors regarding the *level* of trust conferred to them by consumers, consumer trust in some actors may have greater *impact* on general consumer confidence in the safety of food than consumer trust in other actors.

Trust has been found to be a multi-dimensional construct, composed of subdimensions such as care, competence, and openness (for an overview of the literature see Poortinga & Pidgeon, 2003). Different subdimensions of trust (from this point onward 'trust dimensions') may differentially contribute to the enhance-

ment of general consumer confidence in the safety of food, as has been found to be the case regarding consumer perceptions of food risk management quality (Van Kleef et al., 2007).

Although several studies have looked at the impact of trust on consumer attitudes by either distinguishing between specific actors or specific trust dimensions (Frewer, Howard, Hedderley, & Shepherd, 1999; Hornig Priest et al., 2003; Siegrist et al., 2003; Van Kleef et al., 2007), they have failed to provide a systematic account of the extent to which this relationship is specifically attributable to different food chain actors, different trust dimensions, and combinations between actors and trust dimensions. Therefore, using a decompositional regression analysis approach, the aim of this study is to systematically investigate the contribution of specific actors, specific trust dimensions, and combinations between these, in enhancing general consumer confidence in food safety.

7.1.1 Theoretical foundation

Confidence can be regarded as a 'taken-for-granted' attitude towards particular aspects of daily life (see, for example, Berg et al., 2005; Hansen et al., 2003). Confidence is based on familiarity, and is typically lost when a consumer's automatic pre-existing expectations are disappointed (Kjærnes & Dulsrud, 1998, as cited in Hansen et al., 2003). In this study, general consumer confidence in the safety of food is defined as the extent to which consumers perceive that food is generally safe, and does not cause any harm to their health or to the environment.

Consumer confidence in the safety of food might be dependent upon the degree to which consumers trust various actors with responsibility for food safety (Berg et al., 2005; Brunel & Pichon, 2004; Grunert, 2002). Berg et al. (2005) found that the extent to which consumers perceived they could trust food control authorities was positively related to their reported confidence in the safety of food. In addition, a study on consumer perceptions of food risk management (Van Kleef et al., 2007) indicated that the extent to which consumers trusted food risk managers was positively related to their overall judgment of the quality of food risk management, although other factors were also relevant, such as perceptions that a pro-active risk management strategy designed to optimise consumer protection was in place. On the basis of the findings from these previous studies, it is expected that, irrespective of the actor and specific trust dimensions, trust will be positively related to general consumer confidence in the safety of food.

Food safety is the shared responsibility of multiple actors that each plays their part. Some actors might be perceived by consumers to be more important for

ensuring food safety, or to have a larger impact on the safety of food, than other actors. Therefore, it might be expected that the *strength* of the relationship between trust and general confidence will depend on the particular actor under consideration. For example, public perceptions of a controversial technology were found to depend on *which* societal actors were trusted (Hornig Priest et al., 2003): trust in *proponents* of the technology being considered was positively related to acceptance of the technology, whereas trust in *opponents* of the technology was negatively related to acceptance. Since food safety is not a controversial issue with respect to whether safety is generally a good or a bad thing, it is expected in the current study that the *direction* of the relationship between trust and general confidence will be the same for all actors (i.e., positive), but that the *strength* of this relationship will vary between different actors being trusted.

Trust is generally considered to be a multi-dimensional concept (Frewer et al., 1996; Johnson, 1999; Poortinga & Pidgeon, 2003; Renn & Levine, 1991). Previous research has indicated that consumer attitudes were influenced differently by different trust dimensions as in the case of consumer acceptance of a specific potential hazard, i.e., electromagnetic fields (Siegrist et al., 2003). A distinction was made between openness and care on the one hand ('social trust'), and competence on the other hand ('confidence'). The study showed that both dimensions influenced acceptance, but also suggested that their relative contribution to building acceptance might be context dependent, which was confirmed in a follow-up study (Earle & Siegrist, 2006). As a consequence, depending on the situation, acceptance may be more successfully facilitated through focusing on one particular dimension (Earle & Siegrist, 2006). In a study on consumer perceptions of the quality of food risk management practices (Van Kleef et al., 2007) it was found that the perceived honesty of risk managers did not significantly contribute to the perceived quality of food risk management, whereas the perceived expertise of risk managers was consistently found as a significant predictor of perceived food risk management quality across several countries. Building on these findings, in the present study it is expected that different trust dimensions are differentially related to general consumer confidence in the safety of food. That is, irrespective of the particular institution or organisation, the strength of the relationship between trust and general consumer confidence in the safety of food is expected to be dependent upon the specific trust dimension.

Although interaction effects between actors and trust dimensions have not previously been systematically investigated, some studies have explored these interactions in more limited contexts. For example, Peters et al. (1997) found that trust and credibility in environmental decision making was particularly enhanced

by public perception of care from manufacturers, whereas for citizen groups, the perceptions of competence were much more influential (see also Maeda and Miyahara (2003) for a confirmation of these findings in a Japanese context). These results indicate that the extent to which different trust dimensions influence trust in different actors, is dependent upon the actor. Therefore, it is expected that the relationship between trust and general consumer confidence in food safety might be dependent upon specific combinations of actors and trust dimensions.

To summarise, this study extends on previous research by providing a systematic account of the determinants of the strength of the relationship between trust and confidence, by differentiating to what extent the strength of this relationship is attributable to trust in general, trust in different actors, specific trust dimensions, as well as the interaction between actors and trust dimensions. For this purpose, a decompositional regression model is developed that allows for the estimation of decomposed effects for the particular actor, the trust dimension, and the interaction between actors and trust dimensions.

7.2 Method

7.2.1 Data collection and sample

Surveys were administered in December 2003 by a professional market research agency (GfK Panelservices Benelux B.V.). Data were collected among a panel of Dutch consumers with responsibility for the daily grocery shopping. Representativeness of the panel for the Dutch population of people with responsibility for the daily grocery shopping is established through quotas regarding geographical region, place of residence size, household size, and age of the person responsible for the daily grocery shopping. All panel members (4337 consumers) were approached to fill out the questionnaire, and 3669 returned the questionnaire, which reflects a response rate of 85%. Most of the respondents were female (91%). The respondents differed in age (range: 20–65⁺) and education level (low: 26%; medium: 48%; high: 26%). Respondents were included in the analysis when they had answered at least one item of each of the latent measures included in the analysis, which resulted in a net sample of 2892 respondents (79%).

7.2.2 Materials

General consumer confidence in the safety of food was assessed using a measure of confidence that was developed and validated in a previous study (De Jonge et al.,

2007a, 2007b). This scale consists of two distinct dimensions of confidence, i.e., 'optimism' (4 items, $\alpha = 0.83$) and 'pessimism' (3 items, $\alpha = 0.82$) regarding the safety of food. Optimism was measured with the items 'I am optimistic about the safety of food products', 'I am confident that food products are safe', 'I am satisfied with the safety of food products', and 'Generally, food products are safe'. Pessimism was measured using the items 'I worry about the safety of food', 'I feel uncomfortable regarding the safety of food', and 'As a result of the occurrence of food safety incidents I am suspicious about certain food products'. The items were rated on five-point likert scales, ranging from 'disagree strongly' (1) to 'agree strongly' (5).

Measures for the trust dimensions were adapted from items that had appeared in the literature (Frewer et al., 1996; Metlay, 1999; Poortinga & Pidgeon, 2003; Siegrist et al., 2003). The extent to which consumers perceived actors to take *care* of public well-being was measured with the statements '[actor] takes/take good care of the safety of our food' and '[actor] gives/give special attention to the safety of food' ($\alpha = 0.87$). Perceived *competence* was assessed by the following two statements: '[actor] has/have the competence to control the safety of food', and '[actor] has/have sufficient knowledge to guarantee the safety of food products' ($\alpha = 0.82$). Perceived *openness* was measured with the statements '[actor] is/are honest about the safety of food', and '[actor] is/are sufficiently open regarding the safety of food' ($\alpha = 0.88$). Ratings of trust were made for 'food manufacturers' (from this point onward 'manufacturers'), the 'government', 'farmers', and 'retailers'. The four actors about which judgments of trust had to be made were presented to respondents in different orders to make sure the order of presentation would not influence the results. The items were rated on five-point likert scales, ranging from 'disagree strongly' (1) to 'agree strongly' (5). The validity of the three-dimensional structure, as well as the reliability of the trust measure, were assessed by means of confirmatory factor analysis. For all actors, the three-dimensional structure resulted in a satisfactory fit according to conventional fit statistics (see Schermelleh-Engel et al., 2003; $RMSEA \leq 0.05$; $CFI \geq 0.99$; $NNFI \geq 0.98$), and showed convergent and discriminant validity.

7.2.3 Data analysis

To assess the extent to which general consumer confidence in food safety (i.e., optimism and pessimism) is due to trust in general, trust in specific actors, specific trust dimensions, and specific combinations between actors and trust dimensions, separate regression analyses are conducted for 'optimism' and 'pessimism' as the dependent variable. Since four actors and three trust dimensions are distinguished,

12 variables are included in the model as predictors. Predictor variables consist of the average score of each set of two items that reflect the level of trust in a particular actor on a particular trust dimension, for example, the extent to which *manufacturers* are perceived to be *competent*.

First, a standard regression model is estimated with these 12 predictor variables to investigate the relationship between trust in different actors on different trust dimensions (i.e., specific combinations between actors and trust dimensions) and general consumer confidence in food safety (i.e., optimism and pessimism). Although this analysis indicates whether trust in a particular actor on a particular trust dimension, for example the *competence* of *manufacturers*, is significantly related to general consumer confidence, this approach does not provide analytical insight into whether significant effects stem from the actor (manufacturers), the trust dimension (competence), or the specific combination between these.

Therefore, an adjusted version of regression analysis is applied, which allows for a decomposition of the regression coefficients for specific combinations between actors and trust dimensions (e.g., the competence of manufacturers) as obtained from the standard regression model, into main effects of the actor (e.g., manufacturers) across different trust dimensions, main effects of the trust dimension (e.g., competence) across different actors, as well as the interaction between actor and trust dimension (e.g., the competence of manufacturers). By analogy with analysis of variance, this is achieved by taking sums and differences of the trust measures using 'deviation coding'⁸ (see also Draper & Smith, 1998, p. 217-218). The regression coefficients from the standard regression model are now decomposed to reflect 1) the overall average effect of trust across actors and trust dimensions; 2) actor-specific effects; 3) trust dimension-specific effects; and 4) interaction effects.

Four nested models are estimated, whereby every subsequent model includes the previous model, thus allowing for a formal *F*-test to check if the more detailed models are justified in terms of significant improvement in predictive ability compared to the more parsimonious models⁹. In the first model, only the overall average effect of trust is estimated. In other words, it is assessed whether a significant relationship exists between general trust and general consumer confidence in food safety, where for the trust measure no distinction is made between different actors and different trust dimensions. In the second model, the effects for the

8 In deviation coding, the effect for each category of the predictor variable, except one, is compared to the overall effect.

9 To make sure that the significance of the effects did not depend on the order of inclusion of the effects of different actors (Model 2) and different trust dimensions (Model 3), we included the effects for actors and trust dimensions in the reversed order. This did not influence the significance of the effects.

different actors are added, in order to assess whether specific actors build consumer confidence in the safety of food more strongly than others, irrespective of the specific trust dimensions on which this trust is based. In the third model, the effects for different trust dimensions are included to explore whether specific trust dimensions build consumer confidence more strongly than other trust dimensions, irrespective of the actor to which these trust dimensions are attributed. Finally, the fourth model includes all specific combinations of actors and trust dimensions in order to investigate whether the interaction effect between actors and trust dimensions contributes to the prediction of confidence, i.e., to assess whether the effects of actors differ across trust dimensions (or, which is equivalent, whether the effects of trust dimensions differ across actors).

The decomposed regression coefficients for the different actors, the different trust dimensions, and the interaction effects (see Table 7.2 and 7.3), should be interpreted as *deviations* from the coefficient of overall trust¹⁰. From the decomposed effects, the 12 regression coefficients from the standard regression model can be reconstructed, by summing the overall effect, the effect for the actor, the effect for the trust dimension, and the interaction effect of actor and trust dimension (see Table 7.2 and 7.3).

7.3 Results

The results indicate that inclusion of the ‘disentangled’ effects for different actors, the effect for different trust dimensions, and the interaction effects significantly improves the model (Table 7.1). The total amount of variance that is explained by the independent variables is 43% for ‘optimism’, and 21% for ‘pessimism’.

First, the results from the model with optimism as the dependent variable are discussed (Table 7.2). The first column shows the unstandardised regression coefficients from the standard regression model. The subsequent columns show the unstandardised regression coefficients from Model 4, where for each dimension-actor combination, the effect of trust in an actor on a dimension is decomposed into an overall effect of trust, effects per actor, effects per trust dimension, and into interaction effects of actors and trust dimensions. The positive coefficient of *overall trust* ($b_{\text{overall}} = 0.06$) confirms that a higher level of overall trust (i.e., across actors and trust dimensions) enhances the level of optimism with respect to the safety of

¹⁰ The regression coefficients of the 4 actor-specific effects, the 3 trust dimension-specific effects, and the 12 effects for actor-trust dimension combinations can be regarded as contrasts by analogy with analysis of variance, and as such are partly redundant in the regression equation. The significance of the contrasts was established by performing three complementary regression analyses, each with a non-redundant set of construed predictor variables, in order to prevent multicollinearity.

Table 7.1 Comparison of four nested regression models

Model		R ²	ΔR ²	ΔF	Δdf1	df2
Optimism						
1	Overall trust	0.38	0.38	1808.99	1	2890
2	Model 1 + actor-specific effects	0.42	0.04	49.79	3	2887
3	Model 2 + dimension-specific effects	0.42	0.00	15.99	2	2885
4	Model 3 + interaction effects	0.43	0.01	7.62	6	2879
Pessimism						
1	Overall trust	0.17	0.17	608.92	1	2890
2	Model 1 + actor-specific effects	0.19	0.02	21.50	3	2887
3	Model 2 + dimension-specific effects	0.19	0.00	3.28	2	2885
4	Model 3 + interaction effects	0.21	0.02	6.76	6	2879

Note: All *p*-values < 0.001, except pessimism Model 3: *p* = 0.038.

food. The effects for each actor, each dimension, and the interaction effects indicate the *deviation* from the coefficient of *overall trust*. For example, the main effect of trust in manufacturers is 0.13, which is the sum of the effect of overall trust (0.06) and the deviation from this effect for manufacturers (0.07). The significant deviations from the overall effect for the different actors and the different trust dimensions, indicate that optimism about the safety of food significantly varies depending on *who* is trusted (different actors) and *what* is trusted (trust dimension). Trust in manufacturers ($b_{\text{man}} = 0.06 + 0.07$) drives optimism more than does trust in the government ($b_{\text{gov}} = 0.06 - 0.02$), trust in farmers ($b_{\text{far}} = 0.06 - 0.02$), and trust in retailers ($b_{\text{ret}} = 0.06 - 0.03$). The results for the trust dimensions indicate that, overall, care is the most important trust dimension ($b_{\text{care}} = 0.06 + 0.04$), much more so than openness ($b_{\text{open}} = 0.06 - 0.01$), and competence ($b_{\text{comp}} = 0.06 - 0.03$). However, the impact of the trust dimensions on building general consumer confidence in food safety is actor-specific. That is, significant interaction effects exist for the openness and competence dimension related to trust in manufacturers and the government. For manufacturers the results show a positive interaction effect for competence, and a negative interaction effect for openness. This indicates that competence is relatively more important for manufacturers than for the other actors ($b_{\text{man*comp}} = 0.04$), whereas openness is less important ($b_{\text{man*open}} = -0.08$).

For the government the effects are the other way around: competence is less beneficial ($b_{\text{gov*comp}} = -0.06$) and openness is more important for the government ($b_{\text{gov*open}} = 0.07$) than for the other actors. The interaction terms indicate effects specific to a particular combination between a trust dimension and an actor over and above the main effects of the dimension and actor. The direction of the interaction effect is not indicative of the direction of the *total* effect on optimism for a particular combination between a trust dimension and an actor. To know the total effect, all decomposed effects, i.e., overall trust, effect for actor, effect for dimension, and interaction effect should be summed, which gives the unstandardised regression coefficient from the standard regression model. Even though the interaction effect regarding the openness of manufacturers is negative ($b_{\text{man*open}} = -0.08$), the total effect of openness of manufacturers on optimism is positive ($b_{\text{total}} = 0.04$). However, it contributes less to enhancing optimism than does openness of the government ($b_{\text{total}} = 0.10$). Regarding the competence dimension, the results indicate a positive total effect for manufacturers ($b_{\text{total}} = 0.14$). In contrast, for the government, competence does not contribute to enhancing optimism. That is, the negative interaction effect between the competence dimension of trust and the government ($b_{\text{gov*comp}} = -0.06$) results in a negative total effect on optimism ($b_{\text{total}} = -0.04$).

The results for the model with pessimism as the dependent variable are displayed in Table 7.3. Pessimism and optimism are related concepts, indicated by their correlation of -0.56 ($p < 0.001$). Generally, the pattern of significant effects for pessimism is the mirror image of the results from the model with optimism as the dependent variable. That is, a higher level of overall trust reduces pessimism ($b_{\text{overall}} = -0.05$), and, in particular, trust in manufacturers is strongly related to reducing pessimism ($b_{\text{man}} = -0.05 - 0.06$). However, there is one important exception to the similarity in the pattern of significant effects for the models with, respectively optimism and pessimism. The comparison between Tables 7.2 and 7.3 shows that perceptions of care play a different role in enhancing optimism as compared to reducing pessimism. Whereas care came out as the most important trust dimension for enhancing optimism, it plays a limited role in reducing pessimism, as evidenced by the fact that the main effect of care ($b_{\text{care}} = -0.05 - 0.01$) is not significantly different from the effect of overall trust ($b_{\text{overall}} = -0.05$). This finding indicates that the different dimensions of trust have different implications for enhancing optimism and reducing pessimism, and shows that optimism and pessimism are distinct concepts that should not be considered as two end-poles of a uni-dimensional concept.

Table 7.2 Unstandardised parameter estimates for the complete model (Model 4) with optimism

Actor - trust dimension combination	Standard regression model (B)		Decomposed regression coefficients (B)					
	Total	p	Overall trust ^a	Actor ^a	Trust dimension	p	Interaction	p
MAN * care	0.20	< 0.001	0.06	0.07	0.04	< 0.001	0.03	0.081
MAN * competence	0.14	< 0.001	0.06	0.07	-0.03	< 0.001	0.04	0.004
MAN * openness	0.04	0.047	0.06	0.07	-0.01	0.028	-0.08	< 0.001
GOV * care	0.07	< 0.001	0.06	-0.02	0.04	< 0.001	-0.01	0.425
GOV * competence	-0.04	0.004	0.06	-0.02	-0.03	< 0.001	-0.06	< 0.001
GOV * openness	0.10	< 0.001	0.06	-0.02	-0.01	0.028	0.07	< 0.001
FAR * care	0.08	< 0.001	0.06	-0.02	0.04	< 0.001	0.00	0.835
FAR * competence	0.01	0.491	0.06	-0.02	-0.03	< 0.001	0.00	0.903
FAR * openness	0.02	0.404	0.06	-0.02	-0.01	0.028	-0.01	0.737
RET * care	0.05	0.018	0.06	-0.03	0.04	< 0.001	-0.02	0.210
RET * competence	0.02	0.295	0.06	-0.03	-0.03	< 0.001	0.01	0.344
RET * openness	0.02	0.214	0.06	-0.03	-0.01	0.028	0.01	0.576

Note: 'MAN' indicates manufacturers, 'GOV' indicates government, 'FAR' indicates farmers, and 'RET' indicates retailers.

^a All p-values < 0.001.

Table 7.3 Unstandardised parameter estimates for the complete model (Model 4) with pessimism

Actor - trust dimension combination	Standard regression model (B)		Decomposed regression coefficients (B)						
	Total	p	Overall trust ^a	Actor	p	Trust dimension	p	Interaction	p
MAN * care	-0.15	< 0.001	-0.05	-0.06	< 0.001	-0.01	0.503	-0.03	0.357
MAN * competence	-0.15	< 0.001	-0.05	-0.06	< 0.001	0.02	0.006	-0.06	0.008
MAN * openness	-0.04	0.124	-0.05	-0.06	< 0.001	-0.01	0.130	0.09	< 0.001
GOV * care	-0.04	0.163	-0.05	0.01	0.114	-0.01	0.503	0.01	0.767
GOV * competence	0.08	< 0.001	-0.05	0.01	0.114	0.02	0.006	0.10	< 0.001
GOV * openness	-0.16	< 0.001	-0.05	0.01	0.114	-0.01	0.130	-0.10	< 0.001
FAR * care	-0.06	0.075	-0.05	0.02	0.036	-0.01	0.503	-0.01	0.618
FAR * competence	-0.03	0.211	-0.05	0.02	0.036	0.02	0.006	-0.02	0.347
FAR * openness	-0.01	0.623	-0.05	0.02	0.036	-0.01	0.130	0.04	0.166
RET * care	0.01	0.702	-0.05	0.04	< 0.001	-0.01	0.503	0.03	0.239
RET * competence	0.00	0.866	-0.05	0.04	< 0.001	0.02	0.006	-0.01	0.512
RET * openness	-0.05	0.115	-0.05	0.04	< 0.001	-0.01	0.130	-0.02	0.465

Note: 'MAN' indicates manufacturers, 'GOV' indicates government, 'FAR' indicates farmers, and 'RET' indicates retailers.

^a All p-values < 0.001.

7.4 Discussion

This study has provided a systematic analysis of how trust in institutions and organisations enhances general consumer confidence in the safety of food. Using a decompositional regression analysis approach, the research presented here builds on previous research by disentangling the relationship between trust in different actors on different trust dimensions and general consumer confidence in food safety, into separate effects for each actor, each trust dimension, and interactions between actors and trust dimensions. This provides the analytical insight into how trust in institutions and organisations builds general consumer confidence in food safety that previous studies have failed to produce. To our knowledge, this is the first study providing such in depth account in the context of food safety. However, the methodological approach can be applied to other multi-stakeholder, multi-dimensional applications where trust relationships are investigated as well.

By disentangling the strength of the relationship between trust and general confidence, our study shows that overall trust enhances consumer optimism and reduces consumer pessimism in food safety in general. However, the strength of this relationship systematically varies with both the actor being trusted and the trust dimension concerned. Specific interaction effects are identified which cannot be explained by the overall contributions of the actors and the trust dimensions.

Overall, consumer confidence in the safety of food is most strongly enhanced by trust in food manufacturers, much more than trust in the government, farmers, and retailers. This suggests that, when trust in manufacturers is compromised, this might have relatively large consequences for general consumer confidence in the safety of food. A potential explanation for this finding might be that manufacturers are perceived to have more responsibility for the safety of food than farmers and retailers, although less responsibility than the government (De Jonge et al., 2004). That is, a lack of trust in those who are perceived to be responsible may have a stronger impact on judgments of confidence in the safety of food compared to a lack of trust in actors who are perceived to have less responsibility for consumer protection.

In order to generate consumer confidence in food safety, it is important for the different actors in the food chain as well as for regulators to emphasise that they are concerned about public well-being and that attention is being paid to the issue of food safety, i.e., the care dimension of trust. However, the significant interaction effects for particular combinations of actors and trust dimensions indicate that the influence of the different trust dimensions on 'optimism' and 'pessimism' depend on the particular actor under consideration. Under circumstances where an institution has an interest in increasing consumer confidence, the strategy that may be

most optimal to pursue depends on which actor wishes to communicate the information. For example, in the case of manufacturers, consumer confidence might most effectively be increased if part of the message communicated indicates that the well-being of the public is of great concern to the industry. In addition, it is less likely that consumers lose confidence when they believe the industry is competent in dealing with food safety issues. However, for the government, focusing on the openness dimension of trust might prove to be beneficial. That is, whereas care for public welfare only increases the level of optimism, consumer perceptions that the government is open and transparent about food safety matters may both increase the level of optimism and simultaneously reduce the level of pessimism. With respect to farmers and retailers, enhancing consumer perceptions that public welfare is prioritised appears to be an effective way to build consumer confidence in the safety of food. In making recommendations regarding communication practices it is implicitly assumed that it is feasible for different institutions and actors to influence the extent to which they are perceived by consumers to be competent, honest, and taking care of public welfare. However, it should be recognised that this might be a very difficult task, as consumer perceptions may be resistant to change.

The results of the regression analysis indicate that trust in institutions and organisations has a stronger optimism-enhancing than a pessimism-reducing effect. This confirms that optimism and pessimism are indeed separate dimensions of overall confidence in the safety of food. It might indicate that, while trust in different institutions and organisations has a positive effect on optimism, trust does not prevent consumers from worrying about particular incidents or developments, which is reflected in the smaller pessimism-reducing effect of trust. Another potential explanation for the finding that trust is more strongly related to optimism than to pessimism might be that 'trust' was measured rather than 'distrust', which may be regarded as conceptually distinct from trust (Lewicki et al., 1998). Potentially, distrust would be more strongly related to pessimism.

A methodological issue that can be raised is that, on the basis of this analysis, no inferences can be made on causality. That is, it is assumed that trust in particular actors on different trust dimensions influences the level of general consumer confidence in the safety of food. However, it might be that general consumer confidence in the safety of food influences the way consumers evaluate the competence, honesty, and care of institutions and organisations. In previous research it has also been suggested that general attitudes associated with a particular hazard type drive perceptions of risk and trust, rather than the other way around (Frewer et al., 2003). However, empirical evidence to support this has been mixed, which might be related to the strength of consumers' existing attitudes (Eiser et al., 2002;

Poortinga & Pidgeon, 2005). The causality of the effects should be explored further in longitudinal research or through experimental studies.

The results of the current study indicate that the importance of the competence dimension of trust in relation to enhancing optimism and reducing pessimism is limited, except in the case of manufacturers. This observation does not confirm our original predictions. In the case of the government, perceived competence actually reduces optimism and enhances pessimism regarding food safety. This finding is inconsistent with empirical results from a study by Van Kleef et al. (2007) in the related field of consumer perceptions of food risk management quality. Van Kleef et al. (2007) found that public perceptions of food risk management quality were more strongly positively influenced by expertise than by honesty of risk managers. To some extent, this discrepancy might be explained by the nature of the concept of quality, which was used as the dependent variable in the study by Van Kleef et al. (2007). That is, in the context of quality, competence might be a logical first prerequisite. However, when more general public perceptions of optimism and pessimism about food safety are concerned, the extent to which the public feels they are informed openly and honestly, and that care is being taken for public welfare by a particular actor might be more important. Although this may be part of the explanation, it remains unclear why perceived competence of the government would be detrimental to general consumer confidence in the safety of food. Therefore, another direction for future research is to obtain more insight into the role of perceived competence related to different actors in the food chain, and how perceived competence of different actors shapes general consumer confidence in the food safety.

Trust in actors in the food chain is likely not the sole factor influencing general consumer confidence. Previous research has indicated that also other factors, such as the perceived safety of different product categories, are related to consumer confidence in the safety of food in general (De Jonge et al., 2007a). Further, the importance of different actors and different dimensions of trust in generating confidence might vary depending on the type of product category. It would be interesting for further research to investigate to what extent the results from the current study looking at general consumer confidence can be generalised to specific product categories.

The results of this study have shown that the strength of the relationship between trust in institutions and organisations and general consumer confidence in the safety of food is not universal for all stakeholders, and trust dimensions. Although a higher level of trust is for all actors associated with a higher level of general confidence, individual institutions might benefit from giving special attention to specific trust dimensions in their communication activities.



8

Risk reduction strategies in relation to food safety

Abstract

In situations where consumers are uncertain about the safety of food, they are motivated to apply strategies to cope with their concerns. One such strategy is to assume that risks are reduced by reliance on risk relievers, which can either be information or in the form of extrinsic cues associated with products from which consumers infer beliefs about a product's food safety performance. This paper examines to what extent the consumers' use of risk relievers is dependent upon the situation (i.e., a situation of a food safety incident *versus* a normal food purchase situation), and the level of consumer confidence in the safety of food. The results from a survey among 1994 consumers from a household panel indicate that extrinsic cues, such as product certificates, purchase location, and brand are highly indicative for food safety. Information search and the purchase of products with quality labels are key risk relievers that are used by consumers. Reliance on risk relievers is higher among consumers with a low level of confidence in the safety of food, as compared to those with a high level of confidence. The results further show that consumers use risk reduction strategies, even when no food safety incident has occurred. However, these strategies have no identifiable effect on actual purchase behaviour.

8.1 Introduction

Consumers regularly find themselves in situations where they are uncertain about the safety of food products. This is because food safety is a credence attribute (Darby & Karni, 1973), which can often not be verified by the consumer prior to or even after consumption (Grunert, 2002), unless the body responds immediately to the ingestion of contaminated food. For example, in a shopping or consumption situation it is impossible for consumers to reliably assess whether a piece of beef is contaminated with BSE, or whether poultry meat is contaminated with dioxins or Salmonella, although some severe forms of contamination might be visually identifiable from decomposition of the product. When insecure about the safety of food, consumers may be motivated to apply strategies to cope with their concerns (Baron et al., 2000; Brunel & Pichon, 2004; Griffin et al., 1999). Such coping strategies include risk avoidance (Duhachek, 2005; Roselius, 1971), and risk reduction by relying on risk relievers (Derbaix, 1983; Roselius, 1971). Risk avoidance and reliance on risk relievers are particularly relevant for food safety risks, since safety can be considered a non-negotiable product attribute.

Risk avoidance behaviour may manifest itself in ceasing to consume, or reducing consumption of a particular product, and is particularly relevant in the context of a food safety incident (Burton & Young, 1996; Pennings et al., 2002; Piggott & Marsh, 2004; Setbon et al., 2005; Verbeke, Ward, & Viaene, 2000). Pennings et al. (2002), for example, found that people who perceived beef to be risky and who were unwilling to accept the risk of eating beef, were more likely to reduce their beef consumption in response to the BSE crisis. Furthermore, the outbreak of the highly pathogenic Avian Influenza virus H₅N₁ in several countries resulted in consumers limiting or ceasing their consumption of poultry (Food and Agriculture Organization of the United Nations, 2006; Suder & Inthavong, 2008). Typically, shifts in consumption are often temporary following the occurrence of a food safety incident (Piggott & Marsh, 2004). Reducing or ceasing consumption only applies to avoiding consumption of particular product groups, and is only possible when substitute products are available, at least when consumption of products with an important nutritional value are avoided.

A strategy alternative to risk avoidance, following the occurrence of a food safety incident or consumer concern about food safety, is risk reduction by relying on risk relievers. Risk reduction is not so much a matter of ceasing or decreasing consumption (i.e., a change in the consumed quantity), but rather a matter of consuming differently (i.e., a qualitative change in consumption). A risk reliever has been defined in previous research as “a piece of information that increases the

likelihood of product success” (McCarthy & Henson, 2005). External information and observable product features, such as price or brand, can function as risk relievers, when these cues are perceived by consumers to indicate that food is safe (McCarthy & Henson, 2005; Shimp & Bearden, 1982). Although previous research has identified a range of risk relievers that might be used by consumers (McCarthy & Henson, 2005; Roselius, 1971; Verbeke & Vackier, 2004), previous research has infrequently addressed whether the use of risk relievers is dependent upon the situation, and whether different consumers rely on risk relievers to the same extent. The present study examines the extent to which risk reduction strategies are used in two different situations: a situation where a food safety incident has occurred, and a ‘normal’ food purchase situation. Prior research has suggested that each consumer has an idiosyncratic level of risk tolerance, and that risk reducing strategies are only applied when this limit is exceeded (Mitchell, 1998). Therefore, the current study explores whether reliance on risk relievers is greater for consumers with a lower level of confidence in the safety of food, as compared to consumers with greater confidence in the safety of food. The analysis is based on both self-reported reliance on risk relievers, as well as actual food purchases made by consumers.

8.1.1 Literature and hypotheses

Risk reduction is a way for consumers to cope with uncertainties surrounding the safety of food products, for example by making psychological ‘adjustments’ to reduce concerns (Cox, 1967; Dowling & Staelin, 1994). Fishbein and Ajzen (1975) have described two processes that underpin risk reduction behaviour. First, consumers can infer beliefs about the product’s performance on food safety and other credence attributes by trusting and utilising information about the safety of food products provided by external sources, such as the manufacturer of the product, a food safety authority, or the news media. This process is referred to as *informational belief formation*. The beliefs that are formed may function as risk relievers, in the sense that reliance on information provided by external sources might assist consumers in making an informed purchase decision, and relieve concerns (Shimp & Bearden, 1982). Second, when uncertain about the safety of food, consumers can form beliefs about the expected performance of food products regarding their safety by relying on cues based on observable product features. That is, *inferential belief formation* refers to the process where consumers infer credence attribute beliefs (e.g., safety beliefs) using cues for which descriptive beliefs (i.e., beliefs that result from direct observation) are formed (Steenkamp, 1990). Although intrinsic

product features can also serve this function, often these cues are based on extrinsic product features that are not directly related to the intrinsic product, such as brand, quality labels, price, and purchase location (McCarthy & Henson, 2005; Mieres et al., 2006; Roselius, 1971; Verbeke & Vackier, 2004).

Mieres et al. (2006) found that consumers who relied on extrinsic product cues, (such as brand), perceived a larger difference in risk associated with store brands and national brands, compared to consumers who did not rely on such attributes. This indicates that the type of brand is taken as indicative for the level of perceived risk, with store brands being perceived as involving higher safety risk than national brands. Mitchell and Boustani (1994) found that relying on well-known brands was the most important risk reducing strategy for consumers, which was also supported by research showing that private label purchase was lower when product categories were perceived to be risky (Sinha & Batra, 1999). Quality labels can also be used by consumers to infer safety. For example, in the context of the perceived safety of beef, the product's quality label influenced consumers' perceived ability to evaluate the safety of beef in the retail environment (Henson & Northen, 2000), and quality marks were one of the key extrinsic product attributes used by consumers as risk relievers (McCarthy & Henson, 2005). In addition, organic products are sometimes perceived by consumers to be safer than non-organic products (Williams & Hammitt, 2001), and to contain less additives and health harming substances (Torjusen, Lieblein, Wandel, & Francis, 2001), although this might not necessarily always be the case (Magkos, Arvaniti, & Zampelas, 2006). In particular, results from an exploratory study using focus group discussions indicated that consumers found their preference for organic products reaffirmed by the occurrence of food scandals within the conventional food production system (Bock & Wiersum, 2003). Furthermore, when perceived risk is high, consumers are more likely to rely on a product's price as an indicator of quality (Shapiro, 1973), where a higher price is associated with increased quality, and hence lower risk. Finally, an important cue that consumers use to infer beliefs about product safety is purchase location (Derbaix, 1983; McCarthy & Henson, 2005; Mitchell & Harris, 2005; Verbeke & Vackier, 2004). McCarthy and Henson (2005) found that purchase location was the most important risk reliever in the context of buying beef. Results from a segmentation study by Verbeke and Vackier (2004) indicated that consumers who perceived meat choice to be risky, had a higher preference to buy fresh meat at a butchers shop rather than at a supermarket. On the basis of these findings it is expected that extrinsic product features will function as cues that are indicative for the perceived safety of food products. Hence, Hypothesis 1 is formulated as:

H1: Extrinsic product features are perceived by consumers as indicative for the safety of food products.

Informational and inferential belief formation processes may serve as a basis for risk reduction strategies applied by consumers (Henson & Northen, 2000; McCarthy & Henson, 2005; Mitchell & Boustani, 1994; Sinha & Batra, 1999; Verbeke & Vackier, 2004). This is particularly relevant when consumers are making decisions about food safety, and the purchase situation raises concerns or feelings of uncertainty with consumers as is the case with food safety incidents. When an incident occurs, consumers might have a stronger need to use risk relieving strategies and to rely on extrinsic cues. Therefore, it was expected that consumers would rely on risk relievers at the time when a food safety incident occurs. Hypothesis 2a states:

H2a: Consumers use informational and inferential belief formation by relying on information and extrinsic cues in case of a food safety incident.

However, reliance on risk relievers may also differ between individuals. The risk information seeking and processing model developed by Griffin et al. (1999) identifies worry as one of the key factors that influence the extent to which information will be sought and how this information will be processed. In addition, Baron et al. (2000) found that worry was an important predictor of the desire for action in order to reduce risk. Furthermore, previous research has indicated that people who are, generally, more prone to worry and stress, respond to food safety incidents more negatively than those who are low in this trait (see, Verbeke & Van Kenhove, 2002). Based on these studies it might be expected that the extent to which informational and inferential belief formation are used as a strategy to relieve risk, is higher for consumers who have a low level of confidence in the safety of food. Hypothesis 2b therefore states:

H2b: The extent to which consumers rely on information and extrinsic cues to guide their purchase behaviour when a food safety incident occurs is higher for consumers with a low level of confidence in the safety of food.

Although reliance on risk relievers is particularly relevant to consumers in potentially risky food choice situations, such as when a food safety incident occurs, it might be expected that reliance on risk relievers extends to 'normal' purchase situations when no specific food safety incident has occurred, particularly when consumers' confidence in the safety of food is low. That is, in their decision making,

consumers with a low level of confidence in the safety of food may rely on risk relievers on an everyday basis. Therefore, it is hypothesised that consumers with lower confidence in the safety of food would rely more on extrinsic cues and information in a 'normal' purchase situation, where no food safety incident has occurred, when compared to consumers with high confidence in the safety of food. Hypothesis 2c was formulated as:

H2c: Reliance on information and extrinsic cues by consumers with low confidence in the safety of food extends situations where there is no food safety incident.

Finally, it is expected that the use of risk relievers by consumers with low confidence in the safety of food would extend to consumers' actual food purchases in a non-crisis situation. More specifically, it was expected that consumers with a low level of confidence in the safety of food would use price as an indicator of quality (Shapiro, 1973) and pay a higher price per volume, and that they would buy a larger share of their purchases in specialty stores (Verbeke & Vackier, 2004). In addition, low confidence in the safety of food could be related to increased purchase of organic products, when compared to consumers with a high level of confidence in the safety of food.

H2d: Reliance on extrinsic cues by consumers with low confidence in the safety of food extends to consumers' actual food purchases in a non-crisis situation.

8.2 Method

8.2.1 Data

Data were derived from the 'consumer confidence in the safety of food monitor', which has been administered annually between 2003 and 2006 by a professional market research agency (gfk Panelservices Benelux B.V.) among their household panel of Dutch consumers. During the study period, additional data were collected beyond the core monitoring data on consumer confidence in the safety of food. In 2003, actual household purchase data regarding meat and fish purchases was recorded, which included information regarding the extent to which people purchased organic products, the prices paid for products, and the specific outlet from which meat and fish were purchased. Meat products represent an interesting

product group, since various incidents have occurred over the past few decades (Pennings et al., 2002; Verbeke, 2001), and consumer confidence in the safety of meat is relatively low compared to other product groups (De Jonge, Van Trijp, Goddard, & Frewer, 2008a). The purchase data were collected during a period of six months preceding survey data collection (May – October 2003). In 2006, additional survey data were collected regarding risk reduction strategies adopted by consumers. The analysis was confined to the subset of respondents who participated in the household panel in both 2003 and 2006. For these subjects, analyses on self-reported risk reduction strategies was based on the 2006 survey data, and analyses on actual household purchase behaviour was based on the 2003 household purchase data.

8.2.2 Respondents

Respondents participated in a household panel maintained by the market research agency, and were responsible for the daily grocery shopping in their households. Data were available from 3100 respondents in 2003 and from 3482 respondents in 2006. The analyses were confined to 2108 respondents from both the 2003, and the 2006 round of data collection. Respondents were included in the analysis when they had answered at least one item of the optimism and the pessimism sub-dimensions of the general confidence scale, and had purchased at least one type of meat or fish during the period under investigation, resulting in a net sample of 1994 respondents (95%). Both in 2003 and 2006, the representativeness of the panel for the Dutch population of people with responsibility for the daily grocery shopping was confirmed in terms of predefined quota samples based on geographical region, the size of the place of residence, household size, and the age of the person responsible for the daily grocery shopping.

8.2.3 Measures

Three sets of measures were collected: (1) survey-based self-report measures from the consumer monitor survey (specific scale items presented in the Appendix), (2) behavioural outcome measures from household purchase data, and (3) household composition and socio-economic data that serve as covariates in the analysis of household purchase data.

Self-report measures

Consumer confidence in the safety of food was operationalised in terms of its two sub-dimensions optimism and pessimism (De Jonge et al., 2007a), measured through 4 and 3 items respectively. The measures of optimism and pessimism showed good internal reliability ($\alpha > 0.80$) both in 2003 and 2006. For further analysis, respondents were classified as low or high in optimism ($Mdn = 3.7$ [2003], 3.8 [2006]), respectively pessimism ($Mdn = 2.7$ [2003 and 2006]), on the basis of a median split on these two constructs.

The extent to which various product attributes that can function as risk relievers for the safety of food were considered to be *indicative* of food safety, was assessed by having the respondents rate the perceived safety of food products characterised by different levels of a range of product attributes, such as certified *versus* uncertified products, and products sold in different purchase locations, such as specialty stores, high end supermarkets, and discount supermarkets.

Respondents' *intentions to apply specific risk relief strategies in times of a food safety incident* were assessed for a range of risk relievers, such as product certificates, quality labels, branded products, purchase location, and searching information.

The same set of extrinsic attributes were evaluated regarding their importance for respondents *in a normal purchase situation* (i.e., no incident), as well as the importance of the availability of information.

All ratings were made on scales ranging from 1 to 5, with endpoints depending on the specific measure (see the Appendix).

Behavioural outcome measures

Based on the household purchase data, a number of measures were calculated. For each panel member, information was available regarding the household purchase volume of meat and fish, the amount of money spent on meat and fish, the purchase location (specialty store, high end supermarket, value-for-money supermarket, discount supermarket), and whether organic products were purchased. Since meat is, largely, a generic product which is not associated with clearly identifiable brands, no brand information was available for the purchase data. Purchase information was available for poultry, pork, beef and fish.

In order to assess risk reduction behaviour, three measures were calculated. As a measure of *purchase location*, the share of meat and fish purchases (in volume) in each of four different types of stores (specialty store, high end supermarket, value-for-money supermarket, discount supermarket) was calculated. In addition, the

average price paid per kilogram meat or fish was calculated to examine the degree to which price was used as a risk reduction strategy. Finally, risk reduction behaviour through purchasing products with certification was measured by the *purchase of organic products*. Purchase of organic products was expressed as the percentage of consumers that bought organic products at least once during the investigated period.

Household composition and socio-economic data (covariates)

In the analysis of the household purchase data, several household composition and socio-economic variables were included in the analysis that served as covariates. These variables were age, household size, number of children in the home, net income, and education level.

8.2.4 Data analysis

The extent to which the extrinsic product attributes were *indicative* for the safety of food was assessed by means of analysis of variance where the mean scores for the different levels of the same attribute (e.g., organic *versus* non-organic products) were compared. When an attribute had more than two levels (e.g., purchase location), a correction for multiple comparisons was made.

The extent to which respondents' intentions to apply specific risk relief strategies *in times of a food safety incident*, and *in a normal purchase situation* was dependent upon consumer confidence in the safety of food, was investigated by comparing the intended use of extrinsic attributes and information search between respondents low and high in optimism, respectively pessimism, by means of *t*-tests.

Regression analysis was applied to examine the extent to which the level of optimism and pessimism regarding the safety of food influenced risk reduction behaviours in terms of the *share of purchases made in specific retail outlets*, and the *average price paid per kilogram meat or fish*. The key explanatory variables of interest were optimism and pessimism. The perceived safety of the different product groups, and the household composition and socio-economic variables, were included as covariates in the analysis. Regarding the share of purchases made in different purchase locations, one regression model was estimated for each of the four retail outlets (specialty store, high end supermarket, value-for-money supermarket, discount supermarket). With respect to the average price paid for meat and fish, five regressions models were estimated, one with the average price paid for all meat and fish purchased, and four models with the average price paid for a

specific meat type or fish as the dependent variable. Regarding the purchase of organic products, the percentage of respondents that had bought organic meat or fish over the investigated period was compared between respondents low and high in optimism, respectively pessimism, through application of a χ^2 test.

8.3 Results

8.3.1 Extrinsic product cues for food safety inferences

As a test for Hypothesis 1, which stated that consumers infer food safety perceptions from extrinsic product cues, Table 8.1 shows consumer food safety perceptions for different levels of extrinsic cues. In confirmation of H₁, the results show that consumers perceive products with certification, organic production, purchase location, and brand name as highly indicative extrinsic cues for the perceived safety of food products. Perceptions of food safety are enhanced for food products with certification ($F(1, 3505) = 1969.8, p < 0.001$), organically produced foods ($F(1, 3231) = 324.2, p < 0.001$), products purchased from specialty stores and high end supermarkets compared to value-for-money and discount supermarkets, and fresh markets ($F(4, 8789) = 161.8, p < 0.001$), and for food products sold under a (well known) brand name compared to those which were unbranded ($F(2, 4998) = 948.7, p < 0.001$). Overall, these results provide support for Hypothesis 1, indicating that consumers rely on extrinsic product cues regarding their perceptions of food safety. Subsequently, the extent to which consumers actually apply these extrinsic cues as risk reduction strategies in times of food safety incidents is examined.

8.3.2 Informational and inferential belief-based risk reduction strategies

Hypothesis 2a states that consumers will use informational and inferential belief formation as a basis for risk relief strategies in case of a food safety incident. In support of Hypothesis 2a, Table 8.2 shows that information search and the purchase of food products with quality labels are the dominant risk relief strategies in times of food safety incidents. These strategies are more important than price based, outlet based and production-method based (organic) strategies. However, the fact that all scores are close to or above the scale midpoint (i.e., 3) lends support to our expectation that each of the informational and inferential risk relief strategies are perceived as relevant responses in case of a food safety incident.

Table 8.1 External cues as indicators of consumers' perceptions of food safety

Cue	F (p)	M	SE
<i>Product certification</i>	1969.818 (< 0.001)		
With certification		4.12 ^b	0.017
Without certification		2.91 ^a	0.022
<i>Organic</i>	324.190 (< 0.001)		
Organic		3.75 ^b	0.019
Not organic		3.24 ^a	0.021
<i>Purchase location</i>	161.845 (< 0.001)		
Specialty store		3.79 ^d	0.017
High end supermarket		3.81 ^d	0.016
Value-for-money supermarket		3.71 ^c	0.016
Discount supermarket		3.47 ^b	0.019
Fresh market		3.30 ^a	0.019
<i>Brand</i>	948.670 (< 0.001)		
Well known brand name		3.84 ^c	0.016
Unknown brand name		2.91 ^b	0.022
Unbranded		2.67 ^a	0.023

Note: The superscripts indicate mean differences, where different superscripts indicate significantly different means ($p < 0.05$).

Hypothesis 2b states that consumers with low confidence in the safety of food in general (i.e., low (vs high) optimism, and high (vs low) pessimism) are more likely to rely on inferential and informational belief-based strategies to relief risk associated with food products when a food safety incident occurs. In support of Hypothesis 2b, the results lend consistent support to the notion that consumers who are highly pessimistic regarding the safety of food products in general are more likely to revert to informational and inferential risk relief strategies when compared to those lower in pessimism. A similar pattern is found regarding the contrast between consumers low *versus* high in optimism, with the exception of quality label-, price- and brand-based risk relief strategies.

Table 8.2 Intensity of use of extrinsic cues and information when a food safety incident occurs

	General consumer confidence in the safety of food								
	Overall mean	Optimism				Pessimism			
		Low	High	<i>t</i>	<i>p</i>	Low	High	<i>t</i>	<i>p</i>
<i>Informational belief formation</i>									
Searching information	3.50 ^d	3.60	3.37	4.347	<0.001	3.29	3.72	-8.492	<0.001
<i>Inferential belief formation</i>									
More products with certification	3.31 ^c	3.37	3.23	2.46	0.014	3.06	3.56	-9.261	<0.001
More products with quality label	3.42 ^{c,d}	3.46	3.37	1.835	0.067	3.20	3.66	-9.238	<0.001
More organic products	2.75 ^a	2.90	2.58	5.704	<0.001	2.50	3.04	-9.598	<0.001
More branded products	3.08 ^b	3.11	3.05	1.25	0.212	2.90	3.28	-7.588	<0.001
Different store	2.78 ^a	2.91	2.61	4.906	<0.001	2.51	3.06	-8.932	<0.001
More expensive products	2.68 ^a	2.71	2.64	1.391	0.164	2.52	2.85	-6.389	<0.001

Note: The superscripts indicate mean differences, where different superscripts indicate significantly different means ($p < 0.05$). A multiplicity adjustment (Sidak) was applied for multiple comparisons.

Hypothesis 2c states that the findings from Hypothesis 2b extend to the ‘normal’ situation when there is no food safety incident. It is expected that also in those situations consumers low (vs high) in optimism and those high (vs low) in pessimism will pay more attention to information and extrinsic product cues as risk relief strategies in their daily food purchase behaviour. In partial support of Hypothesis 2c, Table 8.3 shows that this is particularly true for consumers high (vs. low) in pessimism, with the exception of using price information as a risk relief strategy. For consumers low in optimism regarding the safety of food products in general, quality labels, information seeking, and buying organic are dominant risk relief strategies compared to those high in optimism, but no differences are found for purchase location, brand, and product certificates. With respect to the role of price as an extrinsic cue to infer product safety from, contrary to our hypothesis, price was perceived significantly more important by consumers high in optimism,

Table 8.3 Intensity of use of extrinsic cues and information in a ‘normal’ situation

	Overall mean	General consumer confidence in the safety of food							
		Optimism				Pessimism			
		Low	High	<i>t</i>	<i>p</i>	Low	High	<i>t</i>	<i>p</i>
<i>Informational belief formation</i>									
Know about information	3.56 ^{c, d}	3.68	3.43	6.389	<0.001	3.33	3.81	-12.653	<0.001
<i>Inferential belief formation</i>									
Product certification	3.54 ^c	3.58	3.50	1.834	0.067	3.36	3.73	-9.003	<0.001
Quality labels	3.64 ^{d, e}	3.68	3.59	2.273	0.023	3.49	3.79	-7.863	<0.001
Organic	2.77 ^a	2.91	2.59	7.135	<0.001	2.51	3.04	-12.012	<0.001
Brand	3.26 ^b	3.26	3.27	-0.142	0.887	3.13	3.41	-6.408	<0.001
Purchase location	3.66 ^e	3.66	3.66	0	1	3.58	3.75	-3.878	<0.001
Price	3.93 ^f	3.89	3.98	-2.255	0.024	3.90	3.97	-1.816	0.07

Note: The superscripts indicate mean differences, where different superscripts indicate significantly different means ($p < 0.05$). A multiplicity adjustment (Sidak) was applied for multiple comparisons.

compared to consumers low in optimism. This might indicate that in a non-crisis situation, consumers who are optimistic about the safety of food attach more importance to buying cheap products in comparison with consumers who have a low level of optimism about the safety of food.

Hypothesis 2d attempts to extend the previous findings in arguing that consumer reliance on extrinsic cues will also reveal itself in actual purchase behaviour of households. That is, it is expected that consumers with low confidence in the safety of food rely more on extrinsic cues than consumers high in confidence. The results show that consumers low and high in optimism and pessimism do not differ significantly in their purchase behaviour in terms of how much they paid for different types of meat, and whether they bought organic products, which means that hypothesis 2d is not supported by the data (Table 8.4). Regarding purchase location the results are largely the same. The only significant differences found relate to purchases made in specialty stores and high end supermarkets. Consumers high in pessimism tend to buy a larger share of their meat and fish in specialty stores, compared to consumers low in pessimism. This effect is at the expense of

Table 8.4 Use of risk relief strategies in overt purchase behaviour of meat

	General consumer confidence in the safety of food							
	Optimism				Pessimism			
	Low	High	<i>t</i>	<i>p</i>	Low	High	<i>t</i>	<i>p</i>
<i>Purchase location</i>								
share purchase volume specialty store	0.021	0.027	0.448	0.654	0.021	0.045	2.284	0.022
share purchase volume high end supermarket	0.513	0.477	-1.815	0.070	0.513	0.479	-2.315	0.021
share purchase volume value-for-money supermarket	0.327	0.351	1.150	0.250	0.327	0.327	-0.052	0.958
share purchase volume discount supermarket	0.103	0.109	0.493	0.622	0.103	0.105	0.167	0.867
<i>Price</i>								
Average price per kg meat and fish	6.064	6.139	0.612	0.541	6.064	6.204	1.524	0.128
Average price per kg poultry	4.409	4.627	1.762	0.078	4.409	4.557	1.584	0.113
Average price per kg pork	5.395	5.323	-0.614	0.539	5.395	5.470	0.844	0.399
Average price per kg beef	5.636	5.743	0.504	0.615	5.636	5.773	0.866	0.387
Average price per kg fish	12.890	13.006	0.318	0.751	12.890	12.859	-0.115	0.909
<i>Product certification / organic products</i>								
Purchase organic products	10.3%	8.8%	1.345 ^a	0.246	9.8%	9.1%	0.313 ^a	0.576

Note: ^a χ^2 statistic.

purchases made in high end supermarkets, which is higher for consumers with a low level of pessimism.

8.4 Discussion

The aim of this study was to investigate informational and inferential belief formation in the context of food safety. The results of this study show that consumers perceive extrinsic product cues, such as product certificates and purchase location, as indicative for food safety, which is in line with previous research in this area

(McCarthy & Henson, 2005; Verbeke & Vackier, 2004). In addition, this study shows that extrinsic cues are not only *indicative* for safety, consumers also indicate that they *use* extrinsic product cues when food shopping for their household. That is, extrinsic product cues function as selection criteria in a shopping situation, and help consumers cope with concerns and uncertainty about the safety of food. Information was also considered by consumers as an important risk reliever. However, the *extent* to which risk relievers are used is dependent upon consumer confidence in the safety of food in general. Consumers with a low level of confidence in the safety of food tend to use risk relievers to a larger extent compared to consumers high in confidence. This finding is in line with the predictions, and shows that the need for risk relievers is higher for consumers who are concerned about the safety of food. In addition, it was found that risk relievers are particularly used by consumers with a high level of pessimism, more than by consumers with a low level of optimism. Intended use of risk relievers during a food safety incident was higher for consumers high in pessimism compared to those low in optimism, and differences between consumers low and high in pessimism were larger than differences between consumers low and high in optimism. This suggests that negative perceptions about the safety of food (i.e., pessimism) are a stronger predictor of consumer reliance on risk relievers than (the lack of) positive beliefs about the safety of food (i.e., optimism). Previous research has indicated that optimism and pessimism about the safety of food are distinct constructs (De Jonge et al., 2007b). That is, positive and negative beliefs may not just be polar opposites, but can differentially relate to specific behaviours (Cacioppo et al., 1997; Conner & Sparks, 2002; Kubzansky et al., 2004). Optimism and pessimism are distinct, but not orthogonal dimensions of the confidence construct (De Jonge et al., 2007b). That is, optimism and pessimism can, to some extent, co-exist (see also the literature on ambivalence, e.g., Conner & Sparks, 2002; De Liver, Van der Pligt, & Wigboldus, 2007), although one of the two might be dominant. Taking the results of current study as an example, the majority of the consumers scored low on optimism and high on pessimism or *vice versa*, 71% and 72% in, respectively, 2003 and 2006, indicating that, in general, some consumers tend to be more optimistic, and some consumers tend to be more pessimistic. Negative affect or anxiety might be more strongly related to avoidance oriented motivational systems, whereas positive affect might be more strongly related to approach oriented motivational systems (see also, Carver & White, 1994; Maner & Gerend, 2007; Watson, Wiese, Vaidya, & Tellegen, 1999). This might explain why optimism and pessimism do not drive risk reduction behaviour to the same extent, and that pessimistic consumers are more oriented towards reducing risk, compared to consumers who are more optimistic.

Both during a food safety incident and under circumstances where food purchase situations are 'normal', consumer reliance on extrinsic cues and information differs between consumers on the basis of their confidence in the safety of food. Apparently, risk reduction behaviour is not only relevant when an incident occurs, but also on an everyday basis.

Although consumers with low confidence in the safety of food tend to rely on risk relievers in both incident and non-incident situations, no evidence was found for consumer reliance on extrinsic cues on the basis of actual purchase data of meat. Potential risks associated with meat, or unwanted substances in meat, are BSE, illegal hormones, antibiotics, dioxins, microbes, or other potentially harmful substances. Organic meat might be less likely to contain some of these substances than conventional meat (e.g., antibiotics, illegal hormones), although this is not necessarily true for all substances (e.g., microbiological contamination) (see, Sofos, 2008), and organic farming methods are also not free from incidents (see, Magkos et al., 2006). Therefore, in the context of meat, reliance on organic products to relieve risk might be regarded by consumers as a good strategy depending on the type of contamination. In general, reliance on extrinsic cues might not have been observed in actual purchase behaviour, because food safety considerations represent just one factor that determines food choice. Other factors identified in previous research that influence food choice are convenience, price, sensory appeal, health, and habit (Aarts & Dijksterhuis, 2000; Lennernas et al., 1997; Steptoe, Pollard, & Wardle, 1995). Particularly in situations of non-crisis, these factors might be more prominent factors that affect food choice, as compared to food safety (Grunert, 2002). That is, relying on risk relievers in actual purchase behaviours might occur mainly when concerns surpass a threshold, for example in the event of a food safety incident.

Appendix. Questionnaire items

Questionnaire items

Optimism (strongly agree - strongly disagree) [2003 and 2006 survey]

- I am optimistic about the safety of food products
- I am confident that food products are safe
- I am satisfied with the safety of food products
- Generally, food products are safe

Pessimism (strongly agree - strongly disagree) [2003 and 2006 survey]

- I worry about the safety of food
- I feel uncomfortable regarding the safety of food
- As a result of the occurrence of food safety incidents I am suspicious about certain food products

When the safety of food products is concerned, what is your opinion about food products that are... (not so safe - very safe) [2006 survey]

Product certification

- Certified
- Non-certified

Organic

- Not organically produced
- Organically produced

Purchase location

- Sold in specialty stores
- Sold in more luxury supermarkets
- Sold in middleclass supermarkets
- Sold in cheap supermarkets
- Sold on the market

Brand

- Sold under a well known brand name
- Sold under an unknown brand name
- Sold unbranded

When the purchase of food products is concerned, how important are the following aspects for you? (not at all important – very important) [2006 survey]

- The brand of the product
 - Product certificates
 - Quality labels
 - Purchase location
 - Price
 - Being aware of information about the safety of food products
 - That the product is produced organically
-

Appendix. Questionnaire items (*continued*)

Questionnaire items

When something is the matter with the safety of food products... (very unlikely – very likely)
[2006 survey]

I buy food products in a different store than usual

I buy more products with certification

I look for information to get to know more about the safety of food products

I buy more products with quality labels

I buy more branded products

I buy more expensive products

I buy more organic products

Notes: All items were rated on 5-point scales. For all statements, respondents were given the opportunity to tick a 'don't know' answer when they thought they were not able to provide a response.

9

General discussion

In developed countries, food safety standards are higher than ever (National Institute for Public Health and the Environment, 2006). Despite this, different food safety incidents continue to occur on a regular basis. Such incidents are typically specific in nature, as they involve particular product groups (e.g., meat, vegetables, dairy) and hazard types (e.g., BSE, dioxins, salmonella). As a consequence, previous research on consumer perceptions of food safety has provided detailed and specific insights into consumer perceptions of specific food-related hazards, or compared these between product categories (Fife-Schaw & Rowe, 1996; Frewer et al., 2003; Williams & Hammitt, 2001), consumer responses to particular food safety incidents (Pennings et al., 2002), or the effects of incidents on the perceived safety of product groups (Verbeke, 2001).

In this thesis, it is assumed that such specific incidents might accumulate to affect consumer confidence in the safety of food more generally. In other words, although a food safety incident is likely to initially influence consumer perceptions and behaviours related to the specific hazard or product group affected (Pennings et al., 2002; Verbeke, 2001), when general consumer confidence in the safety of food has been tested too much over time through the accumulated experience of incidents, general consumer confidence in the safety of food might be negatively affected (Smith et al., 1999). In addition, as a consequence of reduced confidence in the safety of food, consumers might develop adjusted behavioural patterns that fit with their changed perceptions of the safety of food.

It is in this context that the current thesis has developed, and rigorously validated, the construct of general consumer confidence in the safety of food. The research in the thesis has explored which factors drive consumer confidence in the safety of food *in general*, and how general confidence influences behaviour. Hence, the aim of the present research was to develop a measure for the concept of general consumer confidence in the safety of food, and to investigate its antecedents and consequences in an integrative framework. It is proposed that this framework could be used as a monitoring instrument to capture changes in consumer confidence over time, and to assess the long-term impact of the accumulation of food safety incidents, as well as the efficacy of risk management activities applied to risk prevention and mitigation.

In this final chapter of the thesis, the main results and conclusions from this research are discussed, as well as the theoretical and societal implications. The chapter concludes with the limitations of this research, and suggestions for future research.

9.1 Summary and conclusions

In chapter 2 of the thesis, the conceptual framework for consumer confidence in the safety of food was developed on the basis of previous research. Consumer trust in actors in the food chain, and institutions responsible for the management of hazards, consumer recall of food safety incidents and media coverage of those incidents, safety perceptions of product groups, and socio-demographic and personality characteristics were identified as potential determinants of consumer confidence. Information search and changes in food choice behaviour were identified as potential consequences of reduced consumer confidence in the safety of food. In Chapter 3 to 8, the framework was operationalised and validated (see Table 9.1 for the main objectives and results).

Since general consumer confidence in the safety of food is a new construct, no previous measure had been developed in earlier studies. In Chapter 3 a measure of general consumer confidence in the safety of food was developed and validated through exploratory and confirmatory methods to ensure good psychometric properties. An important finding from this research was that consumer confidence in the safety of food is not a uni-dimensional construct, but rather is composed of two distinct, although negatively correlated, dimensions: optimism and pessimism. That is, optimism and pessimism can, to some extent, co-exist, and need therefore to be treated as distinct concepts, and assessed and evaluated separately.

Table 9.1 Overview of the empirical studies of the thesis

Chapter	Objective	Data	Main conclusion
3	Develop measure for consumer confidence in safety of food	<ul style="list-style-type: none"> ▪ Household panel survey (main study, $N > 500$) ▪ Internet survey (validation study, $N > 500$) ▪ Year: 2003 	<ul style="list-style-type: none"> ▪ Confidence is two-dimensional construct ▪ Optimism and pessimism distinguished
4	Assess relative importance of antecedents of general confidence in the safety of food	<ul style="list-style-type: none"> ▪ Internet survey ($N > 600$) ▪ Year: 2004 	<ul style="list-style-type: none"> ▪ Optimism and pessimism differentially enhanced by determinants ▪ Trust in societal actors and the perceived safety of product groups strongest predictors
5	Assess temporal stability of the framework and media attention	<ul style="list-style-type: none"> ▪ Internet survey ($N > 2500$) ▪ Media articles database (> 2000 articles) ▪ Year: 2003-2006 	<ul style="list-style-type: none"> ▪ Framework stable over time <ul style="list-style-type: none"> ◦ Construct inter-relationships ◦ Construct means ▪ Media coverage weakly related to subjective recall
6	Cross-cultural validity of the framework	<ul style="list-style-type: none"> ▪ Internet survey Netherlands ($N > 600$) ▪ Internet survey Canada ($N > 500$) ▪ Year: 2005/2006 	<ul style="list-style-type: none"> ▪ Framework applicable to Canadian context ▪ No differences in construct interrelationships ▪ Differences in construct mean scores
7	Explore the role of trust in more depth	<ul style="list-style-type: none"> ▪ Household panel survey ($N > 3500$) ▪ Year: 2003 	<ul style="list-style-type: none"> ▪ Relationship trust – general confidence depends on <ul style="list-style-type: none"> ◦ Actor ◦ Dimension ◦ Interaction of actor and dimension
8	Explore the predictive validity of the framework for food safety-related behaviours	<ul style="list-style-type: none"> ▪ Household panel survey ($N > 2000$) ▪ Household survey data ($N > 2000$) ▪ Year: 2003 and 2006 	<ul style="list-style-type: none"> ▪ Consumers use risk relievers ▪ Particularly consumers with low confidence ▪ Both during incidents and non-incident situations ▪ No evidence for use risk relievers based on actual purchase data

As a consequence, in further analyses, the two sub-dimensions of general consumer confidence in the safety of food are treated as distinct, but related, variables.

Chapter 4 provides further support for the discriminant validity of the optimism and pessimism dimensions of general consumer confidence in the safety of food. The sub-dimensions are differentially enhanced by the determinants, indicating that optimism and pessimism are 'activated' by different sources. Optimism is strongly based on consumer trust in the government and food manufacturers, whereas pessimism is more strongly influenced by socio-demographic and personality factors. Overall, consumer trust in actors in the food chain, and consumer perceptions of the safety of meat influence general consumer confidence in the safety of food most strongly.

Chapter 5 explores the temporal stability of the framework in more detail and shows that the framework (determinants and general confidence) is stable over time. That is, the measurement properties are robust, and the interrelationships between the constructs, as well as the mean scores on the constructs, show limited variation over time. Further, the results from Chapter 5 show that consumer recall of incidents, which is one of the determinants of general consumer confidence, is weakly related to actual media coverage of food safety-related issues, indicating that consumers are selective regarding the food safety information they pick up from the news media.

Chapter 6 explores and confirms the cross-national stability of the consumer confidence in the safety of food framework. Assessing the cross-national equivalence of the framework in the Netherlands and Canada shows that the relative importance of the determinants in explaining general consumer confidence in the safety of food is the same in the two countries, although differences exist regarding the mean scores on the constructs. That is, Dutch consumers are more optimistic and less pessimistic about the safety of food, and tend to be less concerned about food production practices. One interesting difference between Canada and the Netherlands is the conceptualisation of trust. In Canada, the perceived competence of a particular actor is decoupled from the perceived honesty and care attributed to the same actor, whereas in the Netherlands these dimensions of trust are more strongly interrelated.

On the basis of this finding it was hypothesised that the relationship between trust and general consumer confidence in the safety of food would not only depend on the particular actor with responsibility for consumer protection (as, for example, shown in Chapter 4), but might also depend upon the specific dimensions of trust. This was further explored in Chapter 7 where the effect of trust on general consumer confidence in the safety of food was disentangled into specific effects for

each actor, each dimension of trust, and specific actor-dimension combinations. The results confirm the hypothesis and indicate that differential effects exist for different actors and dimensions of trust, as well as interaction effects. In particular, for the government, consumer perceptions of openness is the most confidence enhancing trust dimension, whereas for the other actors being considered, the consumer perception that they are taking care of public well-being and prioritise consumer protection is most influential on general consumer confidence in the safety of food.

Finally, Chapter 8 of the thesis focuses on the relationship between general consumer confidence and its behavioural consequences. It was shown that the application of risk reduction strategies to cope with uncertainty about the safety of food are, in particular, used by consumers with a lower level of confidence in the safety of food. Again there is asymmetry between the two sub-dimensions: risk reduction strategies are particularly applied by consumers with a high level of pessimism, to a greater extent when compared to consumers with a low level of optimism. That is, optimism and pessimism do not drive risk reduction behaviour to the same extent, which underlines the distinctiveness of optimism and pessimism.

9.1.1 A framework for general consumer confidence in the safety of food

On the basis of the results from this research, it can be concluded that the measurement properties of the proposed framework of general consumer confidence in the safety of food are very robust. The framework (determinants and general consumer confidence in the safety of food) performs well in terms of its measurement properties. That is, the validity of the measures has been established cross-sectionally (Chapter 4), longitudinally (Chapter 5), and cross-nationally (Chapter 6), showing a stable measurement model, which is a prerequisite for investigating construct interrelationships and construct means.

The results show that the interrelationships between the constructs (i.e., the structural model within the framework) are stable, both over time and cross-nationally. However, when considering the issue of temporal stability, it should be noted that no food safety crisis with a large societal impact occurred in the Netherlands during the course of this research. If a food safety incident should occur, the strength of the relationships might alter, but this cannot be formally assessed within the present research project. For example, the impact of consumer recall of food safety incidents and media coverage on general consumer confidence in the safety of food might increase when an incident occurs. However, no such inferences can

be made due to the absence of food safety incidents with an impact on public health over the past four years.

With respect to the construct means, the results show that there is some variation over time (Chapter 5), and that differences exist regarding general consumer confidence in the safety of food, consumer trust in societal actors, and consumer concerns about food production between Canada and the Netherlands (Chapter 6). Furthermore, the results presented in Chapter 8 indicate that different levels of general confidence are characterised by different behaviours. That is, consumers with a low level of confidence in the safety of food (low optimism / high pessimism) more often used risk relievers, as compared to consumers with a high level of confidence in the safety of food.

9.2 Implications

9.2.1 Theoretical implications

The research presented in this thesis demonstrates that the construct of general consumer confidence in the safety of food consists of two distinct dimensions, optimism and pessimism. The distinction between optimism and pessimism about the safety of food has not been made in previous research, which focused on worry (Baron et al., 2000; Sjöberg, 1998), perceived risk (Dosman et al., 2001; Frewer et al., 1994; McCarthy & Henson, 2005; Pennings et al., 2002), and fear (Fife-Schaw & Rowe, 1996; Kirk et al., 2002; Laros & Steenkamp, 2004). The results of our research show that consumer concerns can co-exist with positive beliefs about the safety of food. Therefore, focusing on either positive or negative perceptions provides researchers with incomplete information regarding consumer perceptions of food safety. Furthermore, it is important to distinguish between the two dimensions, since optimism and pessimism are partly influenced by different factors. That is, consumer trust in societal actors more strongly influences optimism, whereas pessimism is more strongly influenced by socio-demographic and personality factors. In addition, the level of consumer pessimism is a stronger predictor of risk reduction behaviours applied by consumers as compared to the level of optimism. Since optimism and pessimism are activated by different factors, and have a different impact on behaviour, these dimensions should be assessed and evaluated separately in future research.

In addition, enhanced insight into how consumer trust in societal organisations and institutions drives general consumer confidence in the safety of food has

been provided. By disentangling the relationship between trust and general consumer confidence in the safety of food into separate effects for different actors, different trust dimensions, and interactions between actors and trust dimensions, insight into how each of these factors shape this relationship has been developed. The results showed that the strength of the relationship between trust and general confidence is not universal for all stakeholders and dimensions of trust (see also section 9.2.2). Therefore, future studies should consider the specificity of trust measures used, since more in depth insight might be obtained when a distinction is made between different societal actors, and within actors between different dimensions of trust.

9.2.2 Societal implications

Implications for risk managers and communicators

The results from this research provide important insights for risk communicators and managers. Enhanced understanding of differences between consumers might help regulators in designing and targeting their communication strategies (see also Kornelis, De Jonge, Frewer, & Dagevos, 2007; Wedel & Kamakura, 2000, p. 5), both in response to actual food safety incidents and to address consumer concerns about food safety, and food safety management more generally. Information about which consumers tend to have a low level of confidence in the safety of food, and what these consumers' concerns are, can be used for the development of effective risk communication messages (Bruhn, 2005; Frewer, 2004). The framework of consumer confidence in the safety of food identifies consumers with a low level of confidence in the safety of food, who might form a specific target group for risk communication efforts. For example, risk communication activities might be specifically targeted at consumers with a low education level, since these consumers tend to have lower confidence in the safety of food as compared to consumers with a higher education. In addition, the framework identifies issues of consumer concern related to the perceived safety of product groups and specific food-related hazards. That is, the results show that consumers are most concerned about the safety of meat products, and food production practices, such as presence of (illegal) hormones in meat.

Longitudinal assessment of the framework as a monitoring instrument increases understanding of the impact of food safety incidents on general consumer confidence in the safety of food, as well as the economic impact of incidents through consumer purchase behaviours. In addition, insight can be obtained on

the effect of policy decisions and new regulations on general consumer confidence in the safety of food. It should be recognised, however, that food safety incidents are more visible to consumers than the installation of new regulations. In addition, since negative events are more newsworthy than positive events, food safety incidents receive more attention in the news media, and are more likely to be recalled by consumers (Poortinga & Pidgeon, 2004; Slovic, 1993; White & Eiser, 2005). It is therefore likely that food safety incidents will have a larger impact on general consumer confidence in the safety of food, compared to food safety improvements through the establishment or reinforcement of regulations. In the absence of such food safety incidents, monitoring developments in general consumer confidence in the safety of food is useful from a pro-active point of view for risk managers and communicators to enable them to be aware of consumer sentiments, and changing issues of consumer concern.

Implications for other stakeholders

Different actors in the food chain and regulators share responsibility in providing safe food to the market (Bergeaud-Blackler & Ferretti, 2006). The results from this research show that consumer trust in societal actors plays an important role for general consumer confidence in the safety of food. However, the strength of this relationship is dependent upon the specific actor, the specific dimension of trust, as well as specific actor-dimension combinations. That is, the research has demonstrated that the importance of the different dimensions is actor-specific. For example, for the government, openness is most important, potentially because the public fears that the government might want to hide particular information from the public, or slow down dissemination of food safety information. With respect to food manufacturers, competence is relatively important, possibly because consumers associate the occurrence of food safety incidents with a lack of competence of food manufacturers to prevent mistakes occurring in the production process.

When a food safety incident occurs and food chain actors provide consumers with information about the incident, the effectiveness of risk communication can be enhanced by addressing the activities related to the different dimensions of trust with a special focus on the dimension that is most important. For example, regarding perceived competence it could be stated how the incident was discovered and what has been done to mitigate the risk (Van Kleef et al., 2006). Openness can be communicated by fully disclosing information (White & Eiser, 2006). Care for public well-being can be communicated through product recalls, even

though the product does not pose an immediate threat to public health (Dawar & Pillutla, 2000).

9.3 Limitations and future research

As specific limitations and suggestions for future research have already been discussed in each of the specific studies reported in Chapters 3 to 8, here the discussion will be restricted to a more general discussion in relation to the overall framework for general consumer confidence in the safety of food.

The integrative framework of consumer confidence in the safety of food that has been developed within this thesis is an important first step in better understanding how specific food safety concerns may accumulate to undermine consumer confidence in the safety of food in general. For that purpose, this thesis examined which factors drive general consumer confidence in the safety of food (i.e., its antecedents) and how confidence influences consumer behaviour (i.e., its consequences). In future research, the analysis of the framework could further be extended, for example, by incorporating causal relationships between the determinants of general confidence, such as effects from recall of food safety incidents on consumer trust in societal actors and the perceived safety of product groups. In addition, direct effects between the determinants and consequences of general confidence can be included, for example the relationship between the perceived safety of product groups and food choice behaviour. This allows to test more formally to what extent general consumer confidence in the safety of food mediates this relationship. In addition, feedback effects may be incorporated in the framework to investigate how changed consumer behaviours result in the establishment of revised perceptions regarding the safety of food. For example, consumer reliance on risk relievers, such as information from external sources, may result in a relief of consumer concerns, which might re-establish consumer confidence in the safety of food.

The framework of consumer confidence in the safety of food was developed as a monitoring instrument, and was assessed on four occasions during the course of this research project. An important feature of such a monitor would be that it is sensitive to changes in food safety-related consumer perceptions over time. On the basis of four annual 'waves' of data collection, few changes over time regarding the constructs of the framework and their interrelationships were observed. However, during the four-year period, no major food safety incidents have occurred with profound consequences for public health. For this reason, it is difficult to draw conclusions on the sensitivity of the framework for consumer confidence in the

safety of food, and its responsiveness to external events. Taking two extremes, general consumer confidence in the safety of food can be considered as either a state characteristic, which is subject to change in response to external events, or as a trait characteristic, which is relatively stable over time, and independent of external events. The latter would mean that general consumer confidence in the safety of food reflects the belief that food safety is under control, that uncertainty is low, and that future events will occur as expected (see, Siegrist, Gutscher, & Earle, 2005). In the absence of food safety incidents with an impact on public health over the past years, which could have functioned to test the sensitivity of general consumer confidence to an external event, it is difficult to determine which of the two conceptualisations of general consumer confidence in the safety of food applies. Establishing the sensitivity of the monitor remains a topic for future research, when more data points are available of external events.

In addition to assessing developments in general consumer confidence in the safety of food 'in the field' on the basis of actual food safety issues, further insight into the extent to which general consumer confidence in the safety of food is responsive to food safety incidents could be obtained through experimental research. General consumer confidence in the safety of food could be assessed prior to, as well as after, presenting consumers with information about hypothetical events. The information about fictitious food safety incidents could be manipulated with respect to, for example, the number of incidents occurring in a given time frame, the characteristics of the incidents (e.g., societal consequences, controllability, see also Lion et al., 2002), as well as the responses by responsible actors (see also Dawar & Pillutla, 2000). Using an experimental approach, insight into how general consumer confidence is influenced by external events can be assessed in a controlled environment. In addition to general consumer confidence in the safety of food, consumer perceptions of particular product groups and hazards involved in the fictitious incidents could be assessed to compare the responsiveness to external events of these variables that differ regarding their level of specificity.

9.4 Final conclusion

In sum, this thesis has provided enhanced insight into the concept of general consumer confidence in the safety of food, as well as how general consumer confidence is embedded in an integrative framework with its antecedents and consequences. This research contributes to a better theoretical understanding of the different factors that influence general consumer confidence in the safety of food,

and shows that general consumer confidence encompasses more than the perceived safety of different product groups. In addition, general consumer confidence in the safety of food is an important predictor of consumer use of risk reduction strategies. Further, the identification of general consumer confidence in the safety of food as consisting of two distinct dimensions, optimism and pessimism, which are differentially influenced by the determinants and characterised by different risk reduction behaviours, provides an important theoretical contribution of this research. The results of this research provide risk managers and communicators, as well as other stakeholders, with important insights and tools to better respond to consumer concerns about food safety issues.

In conclusion, this thesis has extended existing research that largely focused on consumer perceptions of specific food-related hazards, by developing and validating an integrative framework of general consumer confidence in the safety of food, which informs stakeholders that share responsibility on food safety about how confidence develops in the complex environment of the food production system.



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Summary

Food safety has been recognised, both nationally and internationally, as an important issue for society. Despite the fact that food safety standards are higher than ever in the developed countries, food safety incidents continue to occur frequently. As a response to the societal need to effectively assess and manage food hazards, and to provide effective risk communication to the public, new food safety authorities have been established over the last decade. Besides improving food safety *per se*, an important goal of food safety authorities is to strengthen consumer confidence in the safety of food. The concept of general consumer confidence in the safety of food has not been addressed in previous research that has aimed to investigate consumer perceptions associated with food safety. However, specific food safety incidents might accumulate to affect consumer confidence in the safety of food more generally. In other words, although a food safety incident is likely to initially influence consumer perceptions and behaviours related to the specific hazard or product group affected, general consumer confidence in the safety of food might be negatively influenced when it has been tested too much over time through the accumulated experience of incidents. Therefore, in this thesis, *general* consumer confidence in the safety of food is further conceptualised, and embedded within an integrative framework that incorporates the antecedents and consequences of general consumer confidence in the safety of food. It is proposed that this framework could be used as a monitoring instrument to capture changes in consumer confidence over time. In addition, it can be used to assess the long-term

impact of the occurrence of food safety incidents, as well as the efficacy of risk management activities applied to risk prevention and mitigation.

In *Chapter 2*, a conceptual framework for general consumer confidence in the safety of food is developed. The construct of consumer confidence in the safety of food is defined, and different determinants and consequences of general confidence are identified. The determinants of general consumer confidence in the safety of food relate to 1) consumer trust in actors in the food chain and institutions responsible for the management of hazards, 2) consumer recall of food safety incidents and media coverage, 3) the perceived safety of different product groups, and 4) socio-demographic and personality characteristics. The behavioural consequences of general consumer confidence relate to information search and particular food choice behaviours.

As the concept of general consumer confidence in the safety of food has not been defined and operationalised in the existing literature, no reliable and valid operational measure is available for the construct. The aim of *Chapter 3* is, therefore, to develop a measure for general consumer confidence in the safety of food with good psychometric properties, which can be further validated within the framework of the antecedents and consequences of general consumer confidence. Results from exploratory and confirmatory analyses indicate that general consumer confidence in the safety of food consists of two distinct dimensions, optimism and pessimism, which can co-exist within an individual. In the subsequent chapters of the thesis, the two sub-dimensions of general consumer confidence in the safety of food are, therefore, treated as distinct concepts, and assessed and evaluated as separate variables in the analyses.

For the development of effective risk management and communication, it is important to understand which factors influence general consumer confidence in the safety of food. *Chapter 4* focuses on the extent to which the proposed determinants of general consumer confidence in the safety of food uniquely contribute to explaining confidence, and which factors drive general confidence most. Structural equation modelling is applied to simultaneously estimate the effect of the determinants on both dimensions of general confidence; optimism and pessimism. Optimism and pessimism are differentially enhanced by the determinants, indicating that optimism and pessimism are activated by different sources. Optimism is strongly based on consumer trust in the government and food manufacturers, whereas pessimism is more strongly influenced by socio-demographic and personality factors. Overall, consumer trust in actors in the food chain and regulators, and consumer perceptions of the safety of meat, influence general consumer confidence in the safety of food most strongly.

In order to assess the robustness of the framework in terms of its measurement properties, as well as the temporal stability of consumer perceptions of food safety, *Chapter 5* provides a longitudinal perspective on general consumer confidence in the safety of food, and its determinants. In addition, actual coverage of food safety issues in the news media, which are an important source of information to consumers, is longitudinally compared against consumer recall of food safety incidents in order to examine to what extent consumer recall reflects day-to-day media coverage. The results show that the measurement properties of the framework are robust, and that the interrelationships between the constructs, as well as the mean scores on the constructs, show limited variation over time. Further, the results show that consumer recall of incidents, which is one of the determinants of general consumer confidence, is weakly related to actual media coverage of food safety-related issues, indicating that food safety incidents differ in their effect on consumer perceptions, such that some events may increase or amplify consumer concerns, and others are attenuated.

As food chains become increasingly globalised, some hazards have the potential to cross international boundaries. As a consequence, risk assessment, management, and communication are increasingly applied at an international level. In *Chapter 6*, the cross-national applicability of the framework is assessed through a systematic approach comparing data from Canada and the Netherlands. The results show that the framework of consumer confidence in the safety of food is cross-nationally valid. The relative importance of the determinants in explaining general consumer confidence in the safety of food is the same in the two countries. However, differences exist regarding the mean scores on the constructs. That is, Dutch consumers are more optimistic and less pessimistic about the safety of food, and tend to be less concerned about food production practices. One interesting difference between Canada and the Netherlands is the conceptualisation of the trust construct. In Canada, the perceived competence of a particular actor is decoupled from the perceived honesty and care of the same actor, whereas in the Netherlands these dimensions of trust are stronger interrelated.

Consumer trust in actors in the food chain, such as food manufacturers, represents an important determinant of general consumer confidence in the safety of food. Trusting others to ensure the safety of the food supply enables consumers to compensate for their lack of knowledge about complex food production systems. In *Chapter 7* of this thesis, the relationship between trust in specific actors and general consumer confidence in the safety of food is investigated in depth. In particular, this relationship is disentangled such that the effects attributable to specific food chain actors can be identified, together with effects related to specific

dimensions of trust, and effects of specific combinations between actors and different dimensions of trust. The results show that trust in food manufacturers influences general confidence more than trust in other food chain actors, and that care is the most important trust dimension. However, the contribution of a particular trust dimension in enhancing general confidence is actor-specific. In particular, for the government, openness is most confidence enhancing, whereas for the other actors, generally, taking care of public well-being is most influential on general consumer confidence in the safety of food.

In situations where consumers are uncertain about the safety of food, they are motivated to apply strategies to cope with their concerns. *Chapter 8* addresses the relationship between general consumer confidence in the safety of food and its behavioural consequences. In this chapter, the extent to which consumers rely on external information or extrinsic product cues in order to reduce perceived risk associated with food purchases is examined, together with the extent to which this depends on consumers' level of confidence in the safety of food in general, and specific situational factors. It is demonstrated that risk reduction strategies to cope with uncertainty about the safety of food, such as searching for information and purchasing products with quality labels, are particularly used by consumers with a low level of confidence in the safety of food. Moreover, risk reduction strategies are particularly applied by consumers with a high level of pessimism, more than by consumers with a low level of optimism. That is, optimism and pessimism do not drive risk reduction behaviour to the same extent, which underlines the distinctiveness of optimism and pessimism.

In sum, this thesis has provided enhanced insight into the concept of general consumer confidence in the safety of food, as well as how general consumer confidence is embedded in an integrative framework with its antecedents and consequences. This research contributes to a better theoretical understanding of the different factors that influence general consumer confidence in the safety of food, and shows that general consumer confidence encompasses more than the perceived safety of different product groups. Furthermore, general consumer confidence in the safety of food is an important predictor of consumer use of risk reduction strategies. The identification of general consumer confidence in the safety of food as consisting of two distinct dimensions, optimism and pessimism, which are differentially influenced by the determinants and characterised by different risk reduction behaviours, provides an important theoretical contribution of this research.

Few changes over time were observed regarding the constructs of the framework and their interrelationships. However, during the four-year research period, no major food safety incidents have occurred with profound consequences for

public health. For this reason, it is difficult to draw conclusions on the sensitivity of the framework for consumer confidence in the safety of food, and its responsiveness to external events.

The results of this research provide risk managers and communicators, as well as other stakeholders, with important insights and tools to better respond to consumer concerns about food safety issues. Longitudinal assessment of the framework as a monitoring instrument increases understanding of the impact of food safety incidents on general consumer confidence in the safety of food, as well as the economic impact of incidents through consumer purchase behaviours. In the absence of such food safety incidents, monitoring developments in general consumer confidence in the safety of food is useful from a proactive point of view for risk managers and communicators to enable them to be aware of consumer sentiments, and changing issues of consumer concern.

In conclusion, this thesis has extended existing research that largely focused on consumer perceptions of specific food-related hazards, by developing and validating an integrative framework of general consumer confidence in the safety of food, which informs stakeholders that share responsibility on food safety about how confidence develops in the complex environment of the food production system.



Samenvatting (Dutch summary)

Voedselveiligheid wordt zowel nationaal als internationaal gezien als een belangrijke maatschappelijke kwestie. Ondanks het feit dat voedsel in de ontwikkelde landen veiliger is dan ooit tevoren, blijven voedselincidenten zich regelmatig voordoen. Om in te spelen op de maatschappelijke behoefte aan het effectief identificeren en beheersen van voedselrisico's, en het adequaat communiceren van voedselrisico's naar de bevolking, zijn het laatste decennium nieuwe autoriteiten voor voedselveiligheid opgericht. Naast het verbeteren van de fysieke veiligheid van voedingsmiddelen is een belangrijk doel van deze autoriteiten het versterken van het consumentenvertrouwen in de veiligheid van voedingsmiddelen. Het concept 'algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen' is niet onderzocht in voorgaand onderzoek naar consumentenpercepties van voedselveiligheid. Echter, de opeenstapeling van *specifieke* voedselincidenten zou het vertrouwen van consumenten in de veiligheid van voedingsmiddelen in het *algemeen* kunnen beïnvloeden. Met andere woorden, hoewel een voedselincident waarschijnlijk in eerste instantie consumentenpercepties en gedragingen met betrekking tot het specifieke risico of de specifieke productgroep zal beïnvloeden, neemt algemeen vertrouwen in de veiligheid van voedingsmiddelen mogelijk af wanneer het teveel op de proef wordt gesteld door de opeenvolging van incidenten. In dit proefschrift wordt het concept *algemeen vertrouwen* in de veiligheid van voedingsmiddelen daarom verder ontwikkeld en ingebed in een breder kader dat

ook de determinanten en gevolgen van algemeen vertrouwen omvat. Dit raamwerk kan gebruikt worden als een monitor waarmee veranderingen in het consumentenvertrouwen in de tijd kunnen worden gemeten. Daarnaast kan de invloed van voedselincidenten en de doelmatigheid van activiteiten gericht op risicopreventie en -vermindering door middel van de monitor worden vastgesteld.

Hoofdstuk 2 beschrijft de ontwikkeling van een conceptueel raamwerk voor algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen. Het construct van algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen wordt gedefinieerd en de verschillende determinanten en gevolgen van algemeen vertrouwen geïdentificeerd. De determinanten van algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen betreffen 1) consumentenvertrouwen in partijen in de voedselketen en instanties verantwoordelijk voor het beheersen van voedselrisico's, 2) de mate waarin consumenten voedselincidenten en media-aandacht herinneren, 3) consumentenpercepties van de veiligheid van verschillende productgroepen, en 4) socio-demografische en persoonlijkheidskenmerken. De gedragsgevolgen van algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen hebben betrekking op het zoeken van informatie en voedselkeuze.

Het concept algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen is nog niet eerder gedefinieerd en gemeten. Er is daarom geen betrouwbare en valide maat beschikbaar om algemeen vertrouwen te meten. Het doel van *Hoofdstuk 3* is derhalve om een maat te ontwikkelen voor algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen met goede psychometrische eigenschappen. Deze maat kan vervolgens verder gevalideerd worden in het raamwerk van determinanten en gevolgen van algemeen vertrouwen in de veiligheid van voedingsmiddelen. De resultaten van exploratieve en confirmatorische analyses laten zien dat algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen bestaat uit twee dimensies, optimisme en pessimisme, die tegelijkertijd in een individu kunnen bestaan. In de volgende hoofdstukken van het proefschrift worden de twee subdimensies van algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen daarom behandeld als verschillende concepten en gemeten en geïnterpreteerd als aparte variabelen in de analyses.

Voor de ontwikkeling van effectief risicomanagement en adequate risicocommunicatie is het belangrijk te weten door welke factoren algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen wordt beïnvloed. In *Hoofdstuk 4* wordt onderzocht in welke mate de voorgestelde determinanten van algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen een unieke bijdrage leveren aan het verklaren van algemeen vertrouwen en door welke facto-

ren algemeen vertrouwen het meest wordt beïnvloed. Door middel van structurele modellen wordt het effect van de determinanten op beide dimensies van algemeen vertrouwen, optimisme en pessimisme, gelijktijdig getoetst. Optimisme en pessimisme worden verschillend beïnvloed door de determinanten. Dit toont aan dat optimisme en pessimisme door verschillende bronnen worden geactiveerd. Optimisme komt vooral voort uit consumentenvertrouwen in de overheid en voedingsmiddelenfabrikanten, terwijl pessimisme sterker wordt beïnvloed door socio-demografische en persoonlijkheidskenmerken. Over het geheel genomen wordt algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen het sterkst beïnvloed door consumentenvertrouwen in partijen in de voedselketen en regelgevende instanties en consumentenpercepties van de veiligheid van vlees.

De psychometrische robuustheid van het raamwerk en de stabiliteit van consumentenvertrouwen in de veiligheid van voedingsmiddelen worden onderzocht in *Hoofdstuk 5*, waarin algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen en haar determinanten longitudinaal worden onderzocht. Daarnaast wordt media-aandacht voor voedselveiligheid, dat een belangrijke bron van informatie vormt voor consumenten, longitudinaal vergeleken met de herinnering van voedselincidenten door consumenten om te onderzoeken in hoeverre herinnering van incidenten daadwerkelijke media-aandacht weerspiegelt. De resultaten laten zien dat de psychometrische kenmerken van het raamwerk robuust zijn. De relaties tussen de constructen van het model en de gemiddelde scores op de constructen tonen weinig variatie in de tijd. Daarnaast tonen de resultaten dat consumentenherinnering van incidenten (één van de determinanten van algemeen consumentenvertrouwen) slechts zwak gerelateerd is aan daadwerkelijke media-aandacht voor voedselveiligheid. Dit geeft aan dat voedselincidenten een verschillende invloed op consumentenpercepties hebben, waarbij sommige incidenten leiden tot een versterking van zorgen bij de consument en andere incidenten worden afgezwakt.

Doordat voedselketens mondialiseren kunnen bepaalde voedselrisico's grensoverschrijdend zijn. Als gevolg daarvan worden risico-taxaties, – beheersing en – communicatie steeds meer op een internationaal niveau uitgeoefend. In *Hoofdstuk 6* wordt de toepasbaarheid van het raamwerk in een internationale context onderzocht door middel van een systematische vergelijking van data uit Canada en Nederland. De resultaten laten zien dat het raamwerk van consumentenvertrouwen in de veiligheid van voedingsmiddelen valide is in een internationale context. Het relatieve belang van de determinanten voor het verklaren van algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen is gelijk in de twee onderzochte landen. De gemiddelde scores op de constructen van het raamwerk verschil-

len echter tussen de twee landen. Nederlandse consumenten zijn meer optimistisch en minder pessimistisch over de veiligheid van voedingsmiddelen dan Canadese consumenten en zijn minder bezorgd over voedselproductie praktijken. Een interessant verschil tussen Nederland en Canada is de conceptualisatie van het construct van vertrouwen met betrekking tot partijen in de voedselketen en regelgevende instanties. In Canada staat de waargenomen competentie van een bepaalde partij los van de waargenomen eerlijkheid en aandacht van die partij voor publiek welzijn, terwijl deze dimensies van vertrouwen in Nederland sterk aan elkaar gerelateerd zijn.

Consumentenvertrouwen in partijen in de voedselketen, zoals fabrikanten, vormt een belangrijke determinant van algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen. Door vertrouwen te stellen in anderen dat de veiligheid van voedingsmiddelen wordt veiliggesteld kunnen consumenten hun gebrek aan kennis over complexe voedselproductie systemen compenseren. In *Hoofdstuk 7* van het proefschrift wordt de relatie tussen vertrouwen in specifieke partijen en algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen verder onderzocht. De relatie wordt uitgesplitst zodat specifieke effecten voor de verschillende partijen kunnen worden geïdentificeerd, alsmede effecten voor de specifieke dimensies van vertrouwen en specifieke combinaties tussen partijen en dimensies. De resultaten tonen aan dat vertrouwen in voedingsmiddelenfabrikanten algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen sterker beïnvloedt dan vertrouwen in de andere partijen. Aandacht voor publiek welzijn is de belangrijkste dimensie van vertrouwen. De bijdrage van een specifieke dimensie van vertrouwen aan het versterken van algemeen vertrouwen is echter afhankelijk van de partij. Voor de overheid geldt dat algemeen vertrouwen vooral gestimuleerd wordt door openheid, terwijl voor de andere partijen aandacht voor publiek welzijn het sterkst bijdraagt aan algemeen vertrouwen.

In situaties waarin consumenten onzeker zijn over de veiligheid van voedingsmiddelen zijn zij gemotiveerd om manieren te zoeken om met hun zorgen om te gaan. *Hoofdstuk 8* stelt de relatie tussen algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen en de gedragsconsequenties daarvan aan de orde. In dit hoofdstuk wordt onderzocht in welke mate consumenten vertrouwen op externe informatie of extrinsieke productkenmerken om waargenomen voedselrisico's te verminderen. Tevens wordt onderzocht in hoeverre dit afhangt van het niveau van het algemene consumentenvertrouwen in de veiligheid van voedingsmiddelen en situationele factoren. De resultaten laten zien dat risicoreductie strategieën om onzekerheid over de veiligheid van voedingsmiddelen te reduceren, zoals het zoeken van informatie en het kopen van producten met kwaliteitslabels,

vooral worden toegepast door consumenten met een laag algemeen vertrouwen in de veiligheid van voedingsmiddelen. Risicoreductie strategieën worden in het bijzonder toegepast door consumenten met een hoog pessimisme ten aanzien van de veiligheid van voedingsmiddelen, meer dan door consumenten met een laag optimisme. Dit resultaat laat zien dat optimisme en pessimisme risicoreductie gedrag niet op dezelfde manier beïnvloeden, hetgeen het onderscheid tussen optimisme en pessimisme bevestigt.

Dit proefschrift heeft nieuwe inzichten opgeleverd met betrekking tot het concept algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen, alsook hoe algemeen vertrouwen is ingebed in het omvattende raamwerk met de determinanten en gevolgen van algemeen vertrouwen. Dit onderzoek vergroot het theoretisch inzicht in de verschillende factoren die algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen beïnvloeden, en laat zien dat algemeen vertrouwen meer omvat dan alleen de waargenomen veiligheid van verschillende productgroepen. Bovendien is algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen een belangrijke voorspeller van het gebruik van risicoreductie strategieën. Dat algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen bestaat uit twee onderscheidende dimensies, optimisme en pessimisme, die verschillend worden beïnvloed door de determinanten en gekenmerkt worden door verschillend risicoreductie gedrag, vormt een belangrijke theoretische bijdrage van dit onderzoek.

Er zijn weinig veranderingen in de tijd waargenomen met betrekking tot de constructen van het model en hun onderlinge relaties. Echter, tijdens de vier-jarige onderzoeksperiode hebben zich geen grootschalige incidenten voorgedaan met ernstige gevolgen voor de volksgezondheid. Om deze reden is het moeilijk om conclusies te trekken ten aanzien van de gevoeligheid van het raamwerk van consumentenvertrouwen in de veiligheid van voedingsmiddelen en de mate waarin het reageert op externe gebeurtenissen.

De resultaten van dit onderzoek bieden instanties die zich bezighouden met het beheersen en communiceren van risico's, inzichten en handvatten om beter te reageren op consumentenzorgen met betrekking tot voedselveiligheid. Het longitudinaal meten van het model als een monitor verhoogt het begrip van de invloed van voedselincidenten op algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen alsmede de economische invloed van incidenten via het aankoopgedrag van consumenten. In de afwezigheid van dergelijke incidenten is het in de tijd volgen van ontwikkelingen in het consumentenvertrouwen in de veiligheid van voedingsmiddelen zinvol voor een proactieve benadering van risico-beheersing en -communicatie. Het stelt mensen met de verantwoordelijkheid voor

risico-beheersing en -communicatie in staat om op de hoogte te blijven van consumentenpercepties van voedselveiligheid en veranderingen in consumentenzorgen. Dit proefschrift heeft voortgebouwd op bestaand onderzoek dat zich voornamelijk gericht heeft op consumentenpercepties van specifieke risico's, door het ontwikkelen en valideren van een integraal raamwerk voor algemeen consumentenvertrouwen in de veiligheid van voedingsmiddelen. Dit raamwerk informeert partijen die de verantwoordelijkheid over de voedselveiligheid delen over ontwikkelingen in het consumentenvertrouwen in de complexe omgeving van voedselproductie systemen.

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Janneke de Jonge was born in Boxmeer, The Netherlands, on November 8, 1978. She finished her secondary education at the Elzendaalcollege, Boxmeer, in 1997. In the same year she started the study of Business Economics at Tilburg University. In her second year she also studied Sociology, for which she received her propaedeutics in 1999. In 2002, she received her Master of Science degree in Business Economics with a specialisation in Marketing Research. In 2003, she started her PhD research examining consumer confidence in the safety of food within the Marketing and Consumer Behaviour group of Wageningen University. The results of this research are described in the present thesis. During her PhD research she has been involved in the course Consumer Behaviour (MSc-level), where she supervised the practical components, and provided feedback lectures to the students regarding their assignments. From 2004 to 2008 she also presented guest lectures for the Risk Communication course at the MSc level. Since 2007, she has been involved in the EU-funded research projects Safefoods and Sigma Chain. In August 2008 she was appointed as an assistant professor at the Marketing and Consumer Behaviour group of Wageningen University.



Completed Training and Supervision Plan



Description	Institute / Department	Year	Credits*
<i>Courses</i>			
Food Risk Analysis	Mansholt Graduate School of Social Sciences (MG3S)	2006	2.1
Food perception & food preference	Graduate School for Food Technology, Agrobiotechnology, Nutrition and Health Sciences (VLAG)	2003	1
Behavioral Economics	MG3S	2005	2.8
Multivariate Analysis Techniques	Wageningen University	2003	4
Quantitative methods (part 4 of the course; LISREL)	NOBEM	2003	1
Missing data analysis	Universiteit Utrecht	2005	0.5
Computerised Data Collection with Authorware	MG3S	2003	0.5
Research Methodology: designing and conducting a PhD research project	MG3S	2003	2
Scientific Writing	CENTA	2003	1.2
Techniques for writing and presenting a scientific paper	Wageningen Graduate Schools (wgs)	2003	1
Time planning and project management	CT De Wit Graduate School for Production Ecology and Resource Conservation (PE&RC)	2003	0.4
Mansholt Introduction course	MG3S	2003	1
Mansholt Multidisciplinary Seminar	MG3S PhD day	2006	1
Afstudeervak organiseren en begeleiden	Onderwijsondersteuning (owu)	2005	0.6
Hoorcollege geven	owu	2005	0.75
<i>Teaching and supervising activities</i>			
Consumer Behaviour course, practical supervision	Marketing and Consumer Behaviour (MCB)	2004-2007	4
Guest lectures Risk Communication course	Communication Science (COM)	2005-2008	
Advanced Consumer Studies, supervision students	MCB	2004	
Supervision report foreign excursion Mercurius	MCB	2004	
Supervising msc student	MCB	2003	
<i>Presentations at (international) conferences</i>			4
PFGS, Brighton, United Kingdom		2003	
EMAC, Murcia, Spain		2004	
ASPO, Groningen, The Netherlands		2005	
EAAE seminar on trust and risk in business networks, Bonn, Germany		2006	
CAES Crisis in agricultural and resource sectors workshop, Calgary, Canada		2006	
SRA annual meeting, Baltimore, United States		2006	
SRA Europe annual meeting, The Hague, The Netherlands		2007	
AAEA, WAEA, CAES annual meeting, Portland, United States		2007	
Etmaal van de communicatiewetenschap, Amsterdam, The Netherlands		2008	
<i>Total (minimum 20 credits)</i>			27.85

* One credit represents (on average) 40 hours of work
 PFGS stands for Post Graduate Forum on Genetics and Society
 EMAC stands for European Marketing Academy
 ASPO stands for Associatie van Sociaal Psychologische Onderzoekers
 EAAE stands for European Association of Agricultural Economists
 CAES stands for Canadian Agricultural Economics Society
 SRA stands for Society for Risk Analysis
 AAEA stands for American Agricultural Economics Association
 WAEA stands for Western Agricultural Economics Association

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