Risks, benefits, health and the food economy

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This report examines consumer attitudes and purchase behaviour towards risks and benefits of food products. Experimental approaches are used to analyse determinants of consumer risk and benefit perceptions regarding food products. The results suggest that perceptions and behaviour of consumers become more stable as age increases. Determinants of consumer attitudes and behaviour are crucial for sound decision-making of policy-makers and other interested parties.

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Preface

The aim of the present report is to examine the consumer attitudes and purchase behaviour towards the risks and benefits of food products. Experimental approaches are used to analyse the determinants of consumer risk and benefit perceptions regarding food products. In addition, by using real-life purchase data, the change in consumer behaviour during a bird-flu crisis is measured. The empirical results of the experimental approaches show that experience may be a more important determinant than feeling. The empirical results of the impact measurement show that the loss in volumes are completely offset by an opposite price effect. In combination, the results of both approaches suggest that the perceptions and behaviour of consumers become more stable as age increases. In the report, it is argued that both the determinants of consumer attitudes and behaviour are crucial for a sound decision making of managers, public policy makers, and other interested parties.

Dr. J.C. Blom
Director General LEI B.V.

Summary

The aim of the present report is to examine the consumer attitudes and purchase behaviour towards the risks and benefits of food products. Experimental approaches are used to analyse the determinants of consumer risk and benefit perceptions regarding food products. In addition, by using real-life purchase data, the change in consumer behaviour during a bird-flu crisis is measured. In the report, it is argued that both the determinants of consumer attitudes and behaviour are crucial for a sound decision making of managers, public policy makers, and other interested parties.

To analyse the impact of product crises in a market and their associated risks and benefit perceptions, three main research streams can be identified: descriptive studies, controlled lab experiments, and the impact measuring of actual crises on performance measures. This report sets out to provide showcases for two research approaches, e.g. controlled lab experiments and impact measurement.

In showcase 1, experimental methods are used to investigate the negative correlation between risks and benefits. Findings show that when more emotional and less rational consideration of risks and benefits is induced there is a tendency for this correlation to become stronger. However these findings explain only part of the observed findings. Personal knowledge and experience was shown to contribute to no little amount to the correlation. The main findings here are that risk information is less likely to influence public perceptions of well known products such as salmon or apple; and that risk information is also less likely to influence people with more food experience, habitual cooks, and more mature individuals. We also found that for relatively unknown products, it is really the first impression that counts for much; if risk information is given first this determines the perception of benefit as well, and vice versa. Acknowledging such psychological differences may be crucial for the handling of different food crises or the introduction of new products into the market.

In showcase 2, recently developed time-series analysis methods are used to investigate the major drivers of chicken-meat consumption, hereby allowing for potential risks and benefits that consumers may perceive when they buy meat products. Four-weekly data on chicken-meat consumption in the Netherlands for the period from 2000:01 to 2004:13 as collected by GfK was employed. Empirical results show that the bird-flu crisis caused a revenue loss among families where the housewife is thirty years old or younger. This loss, however, is transitory, implying that the long run was not effected by the bird-flu crisis. The empirical results of the impact measurement further show that the loss in volumes are completely offset by an opposite price effect. In addition, the results suggest that for many households, the euro introduction has a dominant effect on their consumption patterns in the long run. In combination, the results of both approaches suggest that the perceptions and behaviour of consumers become more stable as age increases.

Samenvatting (summary in Dutch)

Het doel van dit rapport is om de attitudes en het gedrag van consumenten met betrekking tot de zogeheten risks and benefits van voedselproducten te onderzoeken. Experimentele benaderingen worden gebruikt om de determinanten van de risks and benefits percepties van consumenten te analyseren. Daarnaast, wordt door middel van real-life aankoopgegevens de verandering in consumentengedrag gedurende de vogelgriep gemeten.

Om de impact van product crises in een markt en de daarbij behorende percepties over *risks and benefits* te onderzoeken, kunnen drie onderzoeksstromen onderscheiden worden: beschrijvende studies, gecontroleerde lab experimenten en de impactmeting van de actuele crisis op een zogeheten *peformance measure*. Dit rapport geeft showcases van zowel de experimentele aanpak als wel de impactmeting.

In showcase 1 worden experimentele methoden gebruikt om de negatieve correlatie tussen risk and benefit percepties te onderzoeken. Als emotionele en minder rationele manieren om *risks and benefits* te overwegen gestimuleerd worden, neigt de negatieve correlatie sterker te worden. Ook wordt aangetoond dat persoonlijke kennis en ervaring bijdragen aan deze correlatie. De belangrijkste conclusie is dat risico-informatie over bekende producten zoals appel of zalm, of *risk*-informatie gericht aan ervaren en routinematige voedselbereiders waarschijnlijk minder invloed zal hebben. We vonden tevens dat speciaal bij relatief onbekende producten de eerste indruk het zwaarste telt. Als mensen eerst *risk*-informatie krijgen, bepaalt deze informatie tevens de ingeschatte *benefits*, en vice-versa. Het onderkennen en begrijpen van dergelijke psychologische processen kan cruciaal blijken voor het management van voedselcrises en de introductie van nieuwe producten.

In showcase 2 wordt gebruik gemaakt van recent ontwikkelde tijdreekstechnieken om de belangrijkste drijfveren van de consumptie van kippenvlees te onderzoeken, waarbij het optreden van de mogelijke *risks and benefits* toegestaan wordt. Er is gebruik gemaakt van vierwekelijkse gegevens met betrekking tot kippenvleesconsumptie in Nederland voor de periode 2000:01 tot 2004:13, zoals verzameld door GfK Dongen. Empirische resultaten laten zien dat de vogelgriepcrisis heeft geleid tot omzetverlies bij families waarvan de huisvrouw jonger is dan dertig jaar. Dit verlies was echter tijdelijk, wat betekent dat de langetermijnvooruitzichten van de markt niet is beïnvloed door de vogelgriep. De empirische resultaten laten verder zien dat het verlies in volumes volkomen geneutraliseerd wordt door een verandering in het prijsniveau. Bovendien, suggereren de resultaten dat de euro-introductie een dominant effect heeft gehad voor de consumptie op lange termijn.

In combinatie, laten de resultaten van beide benaderingen zien dat de percepties en het gedrag van consumenten meer stabiel wordt als de leeftijd hoger wordt. In het rapport, wordt beargumenteerd dat zowel de determinanten van consumentenattitudes and het gedrag van consumenten cruciaal is voor managers, overheidsbeleidsmakers en andere belanghebbenden om tot goed gefundeerde beslissingen te komen.

1. General Introduction

In the past decade, markets for consumer goods have faced a substantial number of major events, which were often associated with a huge media attention, and contributed to a much more dynamic market place.[1] In Europe, we may think of price warfares between supermarkets, the introduction of the Euro in the Euro-zone, but also of food-safety issues, e.g. the scare for new food technologies, and a number of food safety incidents (e.g. the mad-cow disease crisis, or the Medroxy Progestrone Acetate (MPA) hormone in animal feed).

In this report, we concentrate on consumer attitudes and purchase behaviour towards the risks and benefits of food products, including the aforementioned incidents. More specifically, (i) using experimental approaches, we examine the determinants of consumer risk and benefit perceptions in regular situations, and (ii) using real-life purchase data, we measure the change in consumer behaviour in irregular situations, i.e. when a major event takes place. Both the determinants of regular and irregular consumer attitudes and behaviour are crucial for a sound decision making of managers, public policy makers, and other interested parties. For instance, the failure to communicate successfully about new (food) technologies can for some part be attributed to a limited understanding among regulators and the food industry of the consumers' assessment of risks and benefits (Fisher en Frewer, in press). A controlled experiment can help to identify these determinants. In addition, the huge impact of product crises can not only be attributed to the risk perception of consumers (Verbeke and Van Kenhove, 2002), but also to associated economic consequences, such as price adjustments (Lloyd et al., 2001), implying that consumers do not assess risks and benefits of, say, the health consequences of new technologies in isolation, but also take the economic consequences into account. The use of real-life data can identify the eventual outcome of the intricate assessments.

Van Heerde et al. (2005) distinguish three main research streams on the impact of product crises in a market: descriptive studies, controlled lab experiments, and the impact of actual crises on performance measures. To date, LEI has profound experience in conducting descriptive (case-)studies, (e.g. Tacken et al., 2003). In figure 1.1, we present the main properties of the three types of research. As indicated in the table, some topics are general in the sense that they always differ among the three research streams, whereas other topics, indicated as 'specific', depend on the research question of focal interest, the statistics that match this question, and the collected measures. For an in-depth analysis of these issues, we refer to Kornelis and Van den Berg (2005).

This report sets out to provide showcases for two research approaches, e.g. controlled lab experiments and impact measurement. In the first showcase, the central theme regards the determinants of consumer risk and benefit perceptions in regular situations. Whereas much early research has focused on risk perception alone, currently the contribution of the

[1] The authors are indebted to Kristina Jansson for excellent research assistance.

perception of personal benefit has also become considered essential (Frewer, 2003; Schenk et al., submitted). A controlled experiment is particularly suited to investigate the causal influence on individual consumer behaviour at the required level of detail. The causalities can even better be determined when the signal to noise ratio is larger. Therefore, for experimental approaches, homogenous groups of participants (e.g. students who are similar in age and education level) can be very well suited; the study thus gets a high level of internal consistency and will deliver precise estimates of the psychological mechanism; and thus prediction which changes will result on which kind of changes in behaviour.

In the second showcase, the central theme regards the short- and long-run consequences of an actual food-safety incident. The responses of groups of consumers to a food-health incident is compared with other major events in the market, so that conclusions about the relative importance of food safety for different types of consumers can be drawn. This approach has immediate descriptive power over aggregated effects that occur in the real world. For the empirical analysis, we use data collected by GfK. The consumer data of GfK is extremely suitable for the analysis of the potential impact of a real-life major event as it provides observations of both consumer response patterns and competitive reactions over a long period of time. In the empirical analysis, we illustrate how a quantitative analysis of this type of data can render insight in market dynamics as a consequence of changing risk or crisis information.

Topic	Tacken et al. (2003)	Showcase 1	Showcase 2
General			
Problem inventarisation	Yes	No	Possible
Technique	Qualitative	Quantitative	Quantitative
Intentions/attitudes	No	Yes	No
Behaviour	Yes	No	Yes
Primary information	Yes	Yes	No
Secondary information	Yes	No	Yes
Internal validity	Low	High	Low
External validity	Low	Low	High
Theory driven	No	Yes	No
Data driven	No	No	Yes
Specific			
Determinants of risk & benefits	No	Yes	No
Consequences of risks & benefits	Yes	No	Yes
Unit of analysis	Sector Level	Single participants	Total population
Statistical method	-	Pearson's correlation; Fisher Z-test	Endogenous-break unit-root tests

Figure 1.1 Examples of differences between the three research approaches

The obtained results of the different research approaches are complementary to solve generic problems. For more specific research projects, or for partial investigation of the larger generic problem the decision which (combination) of the approaches to use should be based the specific, operationalised, research questions in the specific project. For instance, knowledge of specific determinants and underlying mechanisms is essential for

predictions at the level of individual consumer behaviour. In addition, the ultimate success of, say, a communication campaign on food risks and benefits depends on the real-life consumer response in the long-run. All in all, the combined outcomes may benefit public policy makers and market managers in their decision-making process. Even more important, our investigation may help managers to indicate the probable impact of a future health crisis by using consumer characteristics as explaining variables. The complementarity in the findings can be further induced by using the same (or similar) measurements in the various analyses. In this research report, we will use the age of the consumers as such a variable.

2. Showcase 1: Risk and benefit perceptions in food products

An Investigation of the affect heuristic and experience.[1]

Arnout R. H. Fischer[2]

2.1 Introduction

Problem statement
Food is a very important market in the western world. In the USA alone, the food market amounts to a turnover of over USD840 billion, or a yearly per capita expenditure of about USD3,000 in 2001 (USDA, 2003). Although even a tiny slice out of such a huge market may reward successful introduction of new products with massive gross revenues, recently there have been many problems with new products and production technologies which have cost several of the players dearly. The failure of several new technologies can, at least partially, be attributed to limited understanding of government and food industry of consumer psychology and how consumers weigh risks and benefits (Fischer and Frewer, in press).

Risk and Benefits
The debate on consumer acceptance of new products and production technologies in the 1980s has focused mainly on risks and how to understand risk perception of consumers (see Slovic, 1999). More recently an increasing number of publications emphasise that to understand actual consumer behaviour, the role of both risk and benefit has to be studied (see e.g. Alhakami and Slovic, 1994; Cvetkovich et al., 2002; Finucane et al., 2000; Frewer et al., 1997; Frewer et al., 2003; Johnson, 2005; Lowe and Ferguson, 2003; Saba and Messina, 2003; Siegrist, 1999; Siegrist et al., 2000; Wilson et al., 2004). There is evidence, for example in the case of Genetically Modified Organisms, that acceptance is caused to no small amount by tangible benefits for the individual consumer (Frewer, 2003; Schenk et al., submitted). Thus it may prove to be very important to understand how the perceptions of benefits besides those of risk are related to the acceptance of food products.

Negative correlation Risk Benefit perceptions
Perceptions of risk and benefits cannot be studied in isolation, as many studies that measured both risk and benefit perception (e.g. Fischhoff et al., 1978; McDaniels et al.,

[1] A slightly modified version of this section will be submitted for publication in an international scientific journal.
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1997; Slovic et al., 1991) found a consistent negative correlation between risk and benefit perception (see figure 2.2). This negative trend for actually occurring situations is not to be expected as the different theories of human decision making under uncertainty, such as prospect theory (Kahneman and Tversky, 1979); or self-regulation theories (e.g. Carver and Scheier, 1998) agree that (in general) it is likely that high risk/low benefit situations will not be continued in society. Thus, for actually and repeatedly occurring situations, we expect that high risk/low benefit situations are underrepresented, which means we expect that risk and benefits and thus perceptions of risks and benefits should be positively correlated (figure 2.1, Finucane et al., 2000). The consistent finding that risk and benefit perception are negatively correlated is a strong indicator that this relation is influenced by a psychological constraint (Alhakami and Slovic, 1994).

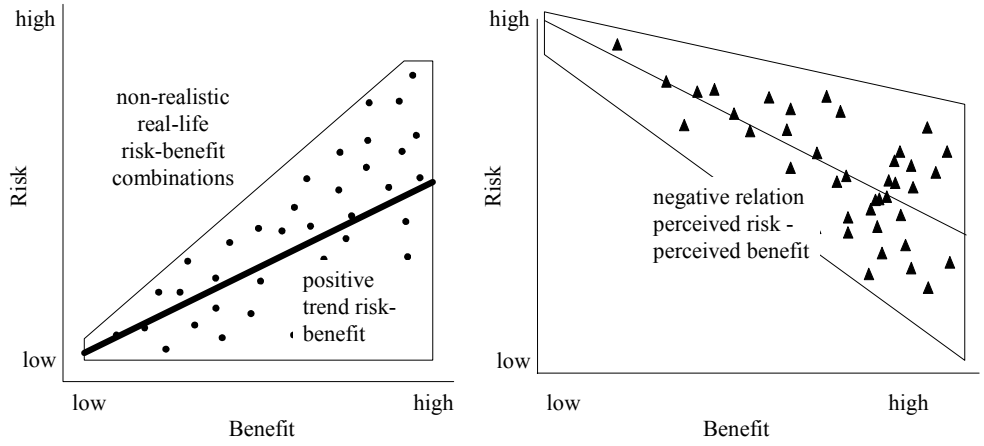

Figure 2.1 Objectively reasonable estimates for risk-benefits combinations that can be realistically assumed to be taken will tend to be positively correlated
Figure adapted from Finucane et al. (2000).

Figure 2.2 For a large number of perceptions of risk and benefits this relation was shown to be negative
Figure based on the data from Alhakami and Slovic (1994).

Theoretical explanation for the negative correlation

Two processes of information processing

The first consequence of treating the relationship between risk and benefit perception as the consequence of an underlying psychological construct, is to abandon the assumption that consumers in all circumstances follow a rational and deliberate weighing of arguments. Similarly, researchers investigating attitude change under persuasive arguments showed from the early 1980's onwards that the same arguments did not always have the same efficacy for all consumers in all situations (Cacioppo and Petty, 1982; Cacioppo et al., 1986). Based on these findings it was suggested that humans have two different systems of decision making, a more systematic, deliberate system in which arguments are carefully weighed, processed and a lasting attitude change can be achieved; and a faster,

heuristic system, where cues and contextual information is used for immediate decision, which do not necessarily lead to lasting attitude change. These dual process theories pose that the deployment of either system depends on personality, motivation, availability of mental processes and necessity of additional information (Chaiken and Maheswaran, 1994; for a comprehensive overview see: Chaiken and Trope, 1999; Peters and Slovic, 2000; Petty et al., 1983; Sloman, 1996). The observed negative relation between risk and benefit perception rules out a strictly systematic and deliberate processing of the available information. However, if both risk and benefit perception are the results of a heuristic process such findings are not necessarily inexplicable.

The Role of Emotion

Emotions are sometimes considered as heuristic processes (Oatley and Johnson-Laird, 1987; Ortony et al., 1988). In many cases emotions infer (often sensible) behaviour adjustments without much conscious effort (LeDoux, 1996). In decision science this idea has further been developed into that of an unconscious decision mechanism (Epstein, 1994), such as the use of a somatic marker (Bechara et al., 1997). The essential role of emotions in decision making under uncertainty can be concluded from recent neurological evidence that shows that certain types of emotional dysfunction can have very serious implications for cognitive functioning, especially in cases where has to be decided between almost identical situations (Bechara et al., 1994). Neurologist Antonio Damasio (1994), for example, describes a patient with this type of brain damage, who cannot decide on which day to make a repeated treatment appointment, as both proposed days are similarly suitable. It is reasoned that in such cases the essential role of emotions in the prioritisation of decisions (cf. Simon, 1967) is disrupted.

While the emotional decision making strategy is shown to be successful for many behavioural choices, the actual reason for the specific choice is often below the threshold of consciousness (Bechara et al., 1997). Selecting the most positive anticipated emotional experience when entering a specific situations could account for this (Damasio, 1994). Anticipated emotional experience is likely to be determined by experiences in similar situations (Fischer and De Vries, submitted), as illustrated by the finding that mere exposure to harmless stimuli results in a positive affect towards these stimuli (Zajonc, 1980).

Risks as feelings

Based on the findings that there are two distinct processes of information processing, and that emotions play an important role, Loewenstein and colleagues (2001) proposed a model where behaviour can depend on both cognitive evaluations, a more deliberate process, and on feelings or affect, a more heuristic process. The heuristic properties of affect were further specified in relation to the perceptions of risk and benefit as the affect heuristic (Finucane et al., 2000). A combination of these approaches shows that both cognitive evaluation and feelings can underlie risk and benefit perceptions (figure 2.4).

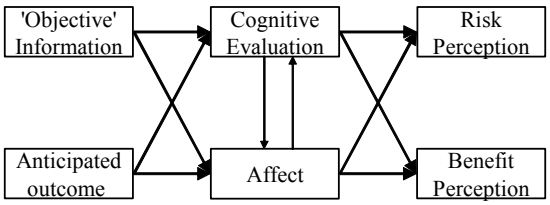

Figure 2.3 Risks and Benefit perceptions based on emotions and dual processes

The affect heuristic (Finucane et al., 2000) only considers the role of feeling in giving an explicit account why a negative correlation between risk and benefit perception is often observed. When the affect heuristic is dominant, a positive affect leads to a high perceived benefit, and the suppression of feeling of risk (figure 2.3). Thus, this mechanism in its simplest form leads to a negative (spurious) correlation between perceptions of risk and benefit, and is assumed to be a heuristic way of dealing with risk information (Finucane et al., 2000).

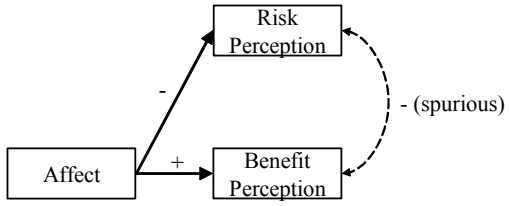

Figure 2.4 The affect heuristic; the role of affect causes the spurious negative correlation between risk and benefit
Source: Finucane et al. (2000).

Alternative approach
In the risk communication literature, it was proposed that the use of other heuristics may also result in a negative correlation between risk perception and benefit perception. If trust in certain information sources is assumed to be a heuristic, the same negative correlation emerges; where arguments in favour of the conclusion of the trusted source are weighed heavier, while arguments against are counted for less (Siegrist, 2000). This model proposes that trust causes attitude, mediated by risk and benefit perception. There is however some criticism against this causal model. Research has shown that more associationistic relationships are probably more likely, where prior attitude underlies both trust and risk perception (figure 2.5 Eiser et al., 2002; Poortinga and Pidgeon, 2005). When this idea is extended with benefit perceptions, prior attitude becomes an important predictor of risk and benefit perceptions and causes the observed negative correlation (Fischer and De Vries, submitted) (figure 2.6).

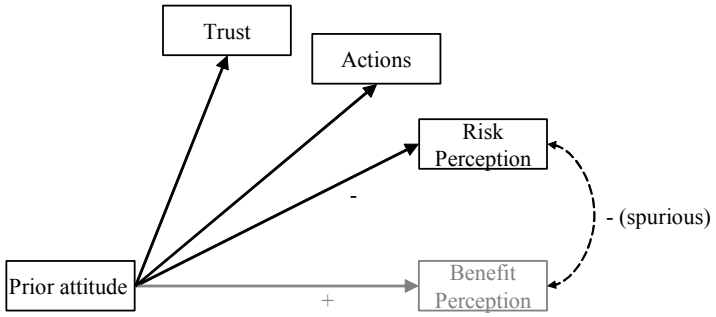

Figure 2.5 Associationist relation between trust, risk and benefit

It is further argued that if the role of prior attitude is indeed that of a heuristic, somatic marker type anticipated emotions (Fischer et al., 2005) can be considered as an important component of the relevant prior attitude. This anticipated emotion may have evolved from repeated experience (Fischer and De Vries, submitted), and is stronger and more predictive with more experience (Fischer et al., 2005). The role of experience maybe of relevance in risk perception (Keller et al., 2006; Siegrist and Gutscher, 2006) and is likely to result in stable levels of risk perceptions, which have stabilised to a level that even contradictory events may never completely change the anticipated outcome (Parry et al., 2004). Thus the stronger the prior attitudes the more likely they act as a heuristic for risk and benefit perception (Frewer et al., 2003).

Current status of the affect heuristic and associated models

The affect heuristic as an idea is simple and intuitively pleasing and has received much attention in the six years since it was first published, as can be concluded from the over 90 cites to the original affect heuristic paper (from Web of science, September 2006). However, there is surprisingly little empirical support for the mechanism; and what evidence there is, is circumstantial and indicative, rather than conclusive (see Siegrist et al., 2006; Slovic et al., 2004). Thus to provide support for the affect heuristic, empirical support is urgently needed. This may be partially accomplished by critical examination of the role of affect as a heuristic. However, if this remains inconclusive, better understanding of the origin and underlying structure of the affect component in the model and for example the discussed role of experience and prior attitude could set the direction for the future development of the idea.

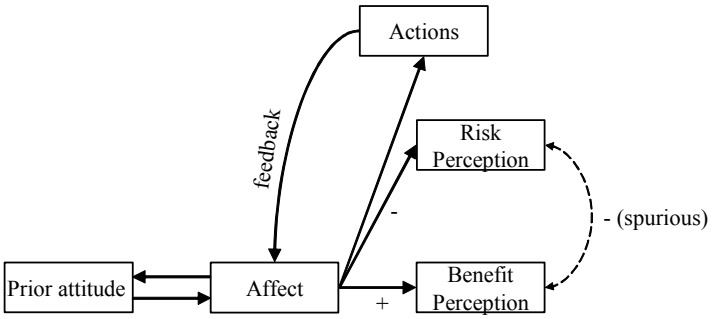

Figure 2.6 The role of repeated experience in the formation of affect
Based on: Fischer and De Vries, submitted.

This paper
The aim of this paper is to achieve better understanding how to model the structure of risk and benefit perception in combination with affect.

To achieve this, we will we try to confirm the classical idea of the affect heuristic (figure 2.3) by emphasising differences in heuristic and deliberate processing of risk and benefit perceptions.

> Hypothesis 1: Consumers who are thinking or deciding in a more heuristic or emotional mode of processing will exhibit a more negative correlation between their risk and benefit perception.

As both the risk as feeling approach, and the associationist approach have a role for the similar concepts of anticipated experience and prior attitude (Fischer and De Vries, submitted), we would also expect a role for prior attitude (see figures 2.3, 2.5, and 2.6) in the relation between risk and benefit perception.

> Hypothesis 2: A stronger prior attitude for a specific situation results in a stronger negative risk benefit perception correlation.

These conceptual hypotheses will be investigated in a series of studies; after operationalising the hypothesis.

2.2 Studies

In a first study we will investigate both conceptual hypotheses in a large representative study, in which we include a manipulation aimed at priming a more affective or more cognitive mode of answering. Building on the findings of study 1, the issue of priming processing mode will be investigated into more detail in the experimentally controlled studies 2. Finally building on the results from the other studies, the role of experience and prior attitude will be investigated into detail in the experimentally controlled study 3.

Methods and materials
By experimentally varying the mode of processing, further insight into the affect heuristic was sought. Study 1 consisted of a survey with two versions, to measure the difference. This approach can be considered a semi-controlled experiment, as pacing, actual attention to the stimuli could not be well controlled for. Study 2a and 2b further investigated this issue through computer administered controlled experiments.

In study 1, habit with cooking and history of food borne illness were investigated as population class observed variables. In study 3, products were chosen that have a different levels of experience in the population to introduce a semi-experimental manipulation.

Analysis
The main measure of interest is the correlation between risk and benefit perception. Although scale rating data is in principle ordinal, Pearson correlation can often be used (see e.g. Finucane et al., 2000). Comparison between Pearson correlation coefficients Fisher's z-transformed correlation coefficients and their standard error are used.

2.2.1 Study 1

Procedure
In this study, conceptual hypothesis 1 was investigated by priming affective versus cognitive processing styles will influence the affect heuristic was investigated. Furthermore, hypothesis 2, the influences of general domain related experience measures on risk and benefit perceptions and the correlation between the measures was studied.

Therefore, in 2005 a nationally representative survey with 1,044 participants was conducted in the Netherlands.

Besides these issues, the survey included several other questions on domestic food preparation and a number of demographics, but also some explanatory variables for risk perception in relation to experience were added: habit and recall of recent food born illness.

The survey was mailed to 1,500 participants in an existing panel of a marketing agency. Half the participants received a survey with affect prime; the other half received a version with the cognition prime. After a round of follow up telephoning 1,044 surveys were returned (~70%), of which 1,013 were useful. The useful surveys gave a representative overview of the Dutch population. Filling out the survey took about 30 minutes. Participants were rewarded with credit points for gifts.

Experimental hypotheses
To investigate hypothesis 1 we will artificially bring half of the participants into a deliberate processing mode, and the other half into a more emotional processing mode. Thus we expect:

> Operational Hypothesis 1.1: Priming with emotional processing versus deliberate processing increases the negative correlation between risk and benefit perception.

Furthermore to investigate the influence of prior attitude strength we will investigate some variables we consider possible indicators for experience, as we posited (Fischer et al., 2005) that increasing experience strengthens the influence of prior attitude in heuristic processing of information.

First of all we consider the role of habit as a heuristic, and as a suppressor of deliberate reasoning in behaviour regulation (Aarts and Dijksterhuis, 2000).

> Operational Hypothesis 2.1a: A larger habit towards food handling increases the negative correlation between risk and benefit perception.

Again, we follow the elaboration likelihood model when we state that increased personal relevance increases the likelihood that people are likely to systematically consider arguments, and the less likely they are to process information heuristically (Petty & Wegener, 1999). We argue that recent illness either to the self or a household member is typically a cause for increased personal relevance (Parry et al., 2004), and thus for diminished effect of the affect heuristic.

> Operational Hypothesis 2.1b: Personal or household suffering from food induced illness in the last 5 years decreases the negative correlation between risk and benefit perception.

Finally we suggest, following the accumulation of experience through life, that older people, who are more exposed to food practices, will be less easily transferred from a heuristic into a more deliberate mode of processing.

> Operational hypothesis 2.1c: Older age increases the negative correlation between risk and benefit perception.

Manipulation and Explanatory Variables

Experimental manipulation: Affect - Cognition

There were two versions of the survey. Prior to the risk benefit perceptions, participants were asked to report their opinion towards other food relation issues. In version 1, participants were asked to report their feeling towards ten different food issues. In version 2, participants were asked to report a deliberate opinion on the same ten issues. This manipulation was developed to prime either an emotional, heuristic processing style (affect condition) or a deliberative, cognitive processing style (cognition condition). See appendix 1 for the items.

Dependent variables

Risk and benefit perceptions of four pairs of food issues were given to consumers. These where about the consumption of chicken meat, the purchase of bacteria free meat, home preparation of chicken meat, and the use of modern technology to kill off all bacteria on chicken. Participants were asked to scale their risk and benefit judgments on a 5-point

scale (see appendix 1 for the wordings). Pearson correlation between these measures was calculated and compared using Fisher's Z test (equation 1) for each different effect.

$$Z_{diff} = \frac{Z_1 - Z_2}{SE_{1,2}} = \frac{\ln\left(\frac{1+r_1}{1-r_1}\right) - \ln\left(\frac{1+r_2}{1-r_2}\right)}{2 \cdot \sqrt{\frac{1}{(n_1-3)} + \frac{1}{(n_2-3)}}} \qquad \text{Eq 1.}$$

Other explanatory variables

Besides the experimentally induced difference in cognitive and affective mode of processing, the role of experience with food preparation, and food related risks is also investigated. As it is not possible to manipulate actual experience of consumers in a one-time survey, we will measure experience in two ways: food preparation habit (Verplanken and Orbell, 2003); and recall of recent foodborne illness (Parry et al., 2004). Furthermore we add age, as an obvious identifier of experience. By grouping the sample on these variables we introduce these variables as quasi experimental variables.

Habit

Habit was measured by a 12-item self-report index of habit strength (Verplanken & Orbell, 2003), with a 7-point Likert scale. The scale showed a similar one-dimensional factor structure (with 3 Eigenvalues larger than 1 of 5.22, 1.64, and 1.04 with the first component accounting for 47.46% of variance and Cronbach α=0.89) as reported by Verplanken and Orbell (2003). To investigate the role of habit, we applied a median split on the habit score into a low habit group (n=530) and a high habit group (N=499) that significantly differed on the habit scale (group mean difference about 1.9 scale point on a 7-point scale, $F(1,1027)=1816$, $p<0.001$).

Illness recall

The personal or within own household experience with a food borne illness was measured on a 4 point scale. The sample was divided into two groups. A group that had not had personal, or in household experience for at least the last 5 years (no recent illness; n=842), and a group that perceived to have, or was confirmed to have suffered from food borne illness, either personally or a member of the household in the last 5 years (recent illness, n=178).

Age

To compare age effects the sample was split into 2 categories: younger adults (up to 40 years of age, n=323) and experienced adults (older than 40 years of age n=719).

Results

Firstly we have to confirm that indeed risk and benefit perceptions are negatively correlated to show that our data replicates earlier findings (Alhakami and Slovic, 1994),

and is useable to investigate the affect heuristic. Indeed, we found significant negative correlations between risk and benefit perceptions over the total sample for all four risk benefit perception pairs (table 2.1). Thus we conclude that in the underlying case some kind of psychological confound to the relation is likely (cf. Alhakami and Slovic, 1994).

Table 2.1 Correlations between food related risks and benefits (N=1036)

No	Issue	Correlation Risk-Benefit (*r*)	*p* values (.05 is significant)
I	Consumption of Chicken meat	-.061	.05
II	Home preparation of chicken	-.186	<.01
III	Bacteria free meat	-.083	<.01
IV	Use of modern technologies to produce bacteria free meat	-.217	<.01
Average correlation		-0.137	

Manipulation

If the underlying constructs of the negative correlation is indeed affect, an emotion, as proposed (Finucane et al., 2000), we would expect that inducing a more emotion based mode of judgement would result in a larger negative correlation, then participants in which a systematic mode is primed. When we compare the correlations between risk and benefit perception in the affect and cognition condition we find a consistent trend supporting the hypothesis that this correlation is larger in the affect condition compared to the cognition condition (table 2.2).

Table 2.2 Change in (negative) correlation between the affect first and the cognition first condition (H1.1)

No	Issue	Correlation Risk-Benefit (*r*)		Difference (affect-cognition)	Fisher Z
		affect (*n*=545)	cognition (*n*=491)		
I	Consumption of chicken meat	-.065	-.060	-.005	0.08
II	Home preparation of chicken	-.220 a)	-.151 b)	-.069	1.14
III	Bacteria free meat	-.144 a)	-.014	-.130	2.10 b)
IV	Use of modern technologies to produce bacteria free meat	-.232 a)	-.195 b)	-.037	0.62
Average difference (aggregated n)				-.060	2.03 b)

a) Significant at $p<.01$; b) Significant at $p<.05$.

When we test these differences using Fisher's Z test for comparison of correlation coefficients (equation 1), we find that only one out of four differences in correlation is significant. A meta-measure over all four issues is also significant (table 2.2). Thus there is some support for hypothesis 1, but it is not conclusive.

Habit

If a generic food handling has evolved it may play an automatic, i.e. heuristic role in food behaviour (Aarts and Dijksterhuis, 2000). In that case we would expect the prominence of the affect heuristic to be larger for participants with a higher general food habit. Or specifically, the correlation between risk and benefit perception is larger negative for participants with more habit. However after conducting a median split, we did find no evidence for this claim (table 2.5), even more typically we found a significant effect in the opposite direction for risk benefit pair IV, the use of modern technologies; arguably the issue that is least related to habit, as use of a truly new technology cannot yet be habitual. Furthermore, there is no indication that there is an interaction between habit level and manipulation, where we might expect that more habit is related to a stronger heuristic, hence less influence of the manipulation. Together this may indicate that domain generic measures, such as food habits, are not specific enough to indicate topic specific risks and benefits.

Table 2.3 Change in (negative) correlation between the low habit and high habit scores (median split) (H2.1a)

No	Issue	Correlation Risk-Benefit (*r*)		Difference (low-high habit)	Fisher Z
		low habit - more cognitive (n=522)	high habit - more heuristic (n=495)		
I	Consumption of chicken meat	-.036	-.084 b)	0.048	-0.77
II	Home preparation of chicken	-.090 b)	-.071	-0.019	0.30
III	Bacteria free meat	-.179 a)	-.181 a)	0.002	-0.03
IV	Use of modern technologies to produce bacteria free meat	-.326 a)	-.099 b)	-0.227	3.80

a) Significant at $p<.01$; b) Significant at $p<.05$.

Illness history

In relation to personal relevance (e.g. Petty and Wegener, 1999), we would expect that recall of a recent food related illness for the self of the family would increase motivation to balance the risk benefit judgement and therewith decrease the influence of heuristic processing. The findings however imply that people with a recent illness history exhibit a larger negative correlation between risk and benefit perception (table 2.4). This can however be confounded by other mental and demographic variables. There is an interaction between recent illness history and the cognition or affect induced condition. A recent illness increases the effect of the manipulation. In other words, people who have suffered from a recent illness are more likely to change their mode of reasoning towards more deliberative when this is primed. This is in line with the theoretical expectation that personal relevance is larger for this group.

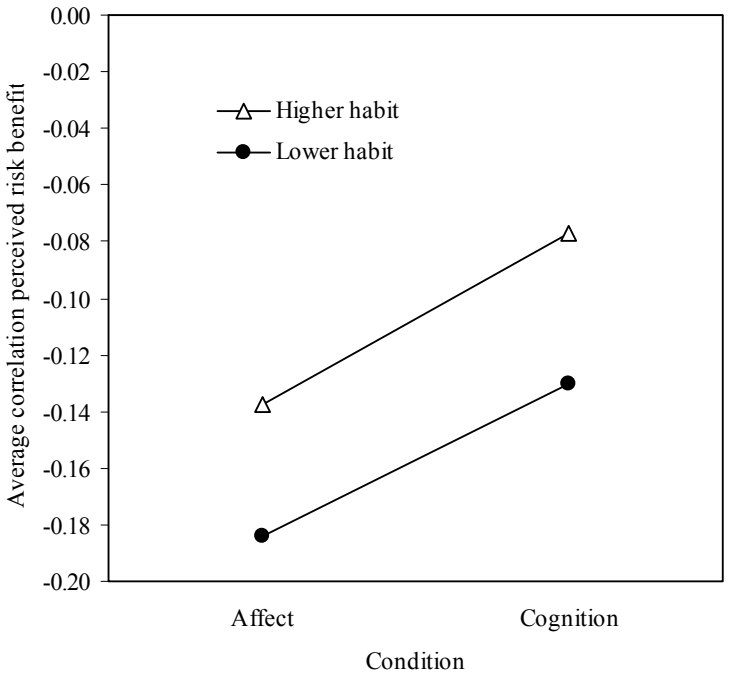

Figure 2.7 Effect of the manipulation on average correlation coefficient for low and high habit. Note that the depicted difference between low and high habit is due to the influence of modern technology

Table 2.4 Change in (negative) correlation between the recent illness (last 5 years) and no recent illness scores

Issue	Correlation Risk-Benefit (*r*)		Difference	Fisher Z
	no recent illness - more heuristic (n=842)	recent illness - more deliberate (n=178)		
Consumption of chicken meat	-0.028	-0.241 a)	0.213	2.62 a)
Home preparation of chicken	-0.055	-0.175 b)	0.120	1.46
Bacteria free meat	-0.175 a)	-0.221 a)	0.046	0.57
Use of modern technologies to produce bacteria free meat	-0.176 a)	-0.429 a)	0.253	3.38 a)

a) Significant at $p<.01$; b) Significant at $p<.05$.

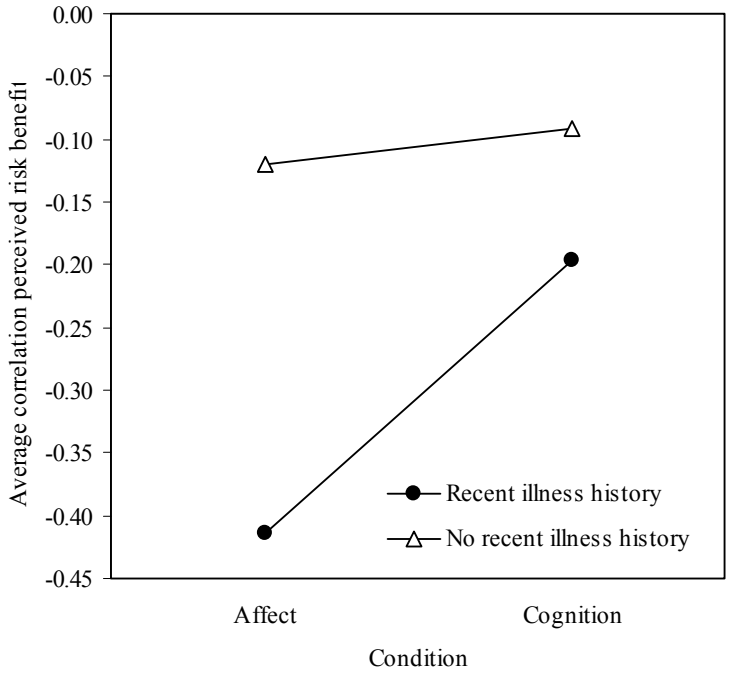

Figure 2.8 Interaction between recent illness history and manipulation

Age

To investigate the effect of age, we subdivided the sample into two groups. A group of young adults age under (40 years; n=323) and a group of experienced adults (aged 40+; n=719). For this comparison we find the general tendency that older people exhibit a stronger negative correlation between risk and benefit, which supports the idea that more experience through age strengthens the use of heuristic (H2c). The only exception is the case of modern technologies where older people tend to show lower negative correlation than younger people, which can be explained by a greater dislike and scepticism for new technology with older people (Tuorila et al., 2001); this in itself may trigger a more conscious reasoning, counterbalancing the generally larger influence of heuristic processing among these older people.

Table 2.5 Change in (negative) correlation between younger and more experienced adults

No	Issue	Correlation risk-benefit (*r*)		Difference	Fisher Z
		young adults (age < 40; n=323)	experienced adults (age 40+; n=719)		
I	Consumption of chicken meat	-0.039	-0.073	0.034	0.51
II	Home preparation of chicken	-0.011	-0.121	0.110	1.64 b)
III	Bacteria free meat	-0.108	-0.221	0.113	1.72 b)
IV	Use of modern technologies to produce bacteria free meat	-0.250	-0.203	-0.047	-0.73

a) Significant at $p<.01$; b) Significant at $p<.05$.

When we compare the effect of affect or cognition priming among the more experienced adults with those of the younger adults over all four risk benefit pairs, we notice that younger participants in the affect condition show a significantly more negative correlation than participants from this same age category in the cognitive condition (Z=2.04; p=.02). The effect of the manipulation on older people is not significant. This indicates that not only do older people use their experienced opinion to a larger extent than younger people, but more specifically that it is more difficult to change their judgment from the heuristic towards a more cognitive judgement than the younger. This can imply that the strength of the affect or of the prior attitude is generally larger for more experienced adults than for younger adults.

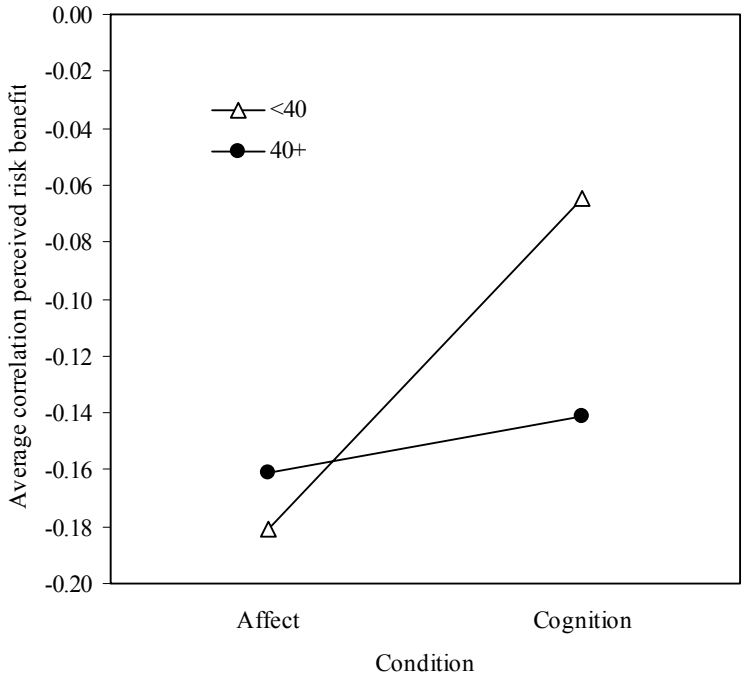

Figure 2.9 Effect of the manipulation for younger adults (<40 years), and experienced adults (40+)

Discussion of study 1

First of all, we found negative correlations within all our risk benefit pairs. Thus we can conclude that food issues, or at least these food issues are suited for further analysis along the lines of the affect heuristic.

When emotional judgments are primed, we do indeed find an increase in the negative correlation as predicted by the affect heuristic (H1a). However, this change is only significant in one out of four risk benefit pairs (and the overall measure). Thus the results speak in favour of the affect heuristic but are not conclusive.

More habitual food preparation behaviour has no effect on the correlation between risk benefit pairs, although more heuristic, i.e. a stronger negative correlation was expected

(H2a). One reason why this may be the case is that the general food preparation habit is too far removed from the specific food issues the risk and benefits were asked of. If this is the case, the overall habit may not necessarily imply there is a strong affect concerning individual issues. Interestingly we observed that for a new technology, those participants with low habit score exhibit the larger negative correlation. Perhaps stronger habit, more experience, or prior attitude plays a stabilising, anchoring role instead of merely a heuristic. In study 3 we will investigate this further by considering experience with specific products.

Similarly we did not find an effect of personal illness history on the correlation between risk and benefit perception, although we expected that more personal experience would support deliberative reasoning and thus decrease the negative correlation (H2b). We did however find that the difference between the cognitive primed condition versus the affect primed condition was significant in two out of the 4 issues (and the overall measure), for people who recalled recent food induced illnesses. This is in line with our theory to the amount that although people who have suffered ill effects may still use heuristic processes in judging risks and benefit, the increased personal relevance allows them to be more easily transferred to a deliberative processing mode.

Personal experience with many risks is due to age. Indeed we find that more experienced people of over 40 years in age apparently tend to rely more on their intuitive knowledge than younger people, and that they are less easily brought into a cognitive mode of reasoning about these risks. This last finding implies that not only does prior experience or attitude in itself plays a role but also that the strength of the prior attitude should be considered (see e.g. Krosnick et al., 1993). In practice, the finding that older people show no difference between the affect an the cognition condition, may imply that their heuristic processing is stronger developed. Thus, we would also expect that information about risk or benefits, e.g. food scares, does not influence intention of the older adults as much as it does younger. This, idea was confirmed with an account of buying behaviour, where long term changes in buying behaviour after a crisis were only found for younger adults (Kornelis, 2006; this report).

One of the problems with the reported population size measures is that we cannot account for interrelations, i.e. education level is known to influence risk perception, but in our sample self reported illness was also correlated to education level. This makes interpretation of these variables difficult. In the further studies, we will adopt a controlled environment with more homogenous participant samples to control these issues. The choice for a younger population is herein justified as these population showed larger effects sizes.

2.2.2 Study 2: Experimental investigation into heuristic processing and affect heuristic

As the following experiments are conducted to confirm the trends already established in a representative survey, we choose a homogenous, non representative, convenience sample of students for these experiment.

Although we found a number of expected results in study 1, the most important idea, that increased focus on heuristic processing would lead to a more negative correlation between perceived risks and benefits, could not be proven conclusively. Therefore in study

2a, we attempted to induce a similar effect through a controlled experiment. This allowed us to enlarge the manipulation, and by administering the computerised tests in a similar way to reduce noise levels by excluding different circumstances. Furthermore by choosing a homogenous sample with similar experience (students of our university) we expect to reduce noise levels even further. These steps should help us in being more sensitive for the actual effects of the manipulation.

Study 2a: Mood prime-scrambled sentence

In this experiment we will further investigate how priming participants to be in an emotional versus a more deliberate state of mind influences the correlation between risk and benefit perception. This is basically a replication of the manipulation in study 1, however this time the mood inducement procedure will be made stronger, and a more homogenous group of participants in comparable situations are selected to reduce measurement noise.

> Operational Hypothesis 1.2a: Priming with an emotional thought frame versus a more calculative thought frame increases the negative correlation between risk and benefit perception.

Methods and materials

Participants

Participants were 97 students of Wageningen University. 74 were female, 23 were male. The age ranged from 18-31.

Conditions were randomly assigned to participants by the computer program. 47 were given the affect or intuition prime, 50 the rational prime.

One female respondent in the rational condition reported that she had not learned Dutch before the age of 6, and was subsequently removed from analysis. Four participants reported that the priming task may have influenced the risk benefit measures, which is a low proportion. Their scores did not noticeably deviate from other participants, and these participants were not removed from further analyses.

Materials

To prime the mode of thinking of participants, the scrambled sentences methods is used (Srull and Wyer, 1979). In this method participants are given 24 lists of 5 words each. 16 of the 24 lists contain a word priming the condition. In condition 1 words associated with a calculative mindset were included, in condition 2 words were associated with an intuitive mindset. Participants are asked to form correct sentences using four of the five words. The used sentences were adjusted to our purposes from those used by Kay and Ross (2003, see appendix 2).

Dependents

After finishing either of the primes, participants had to score 6 pairs of risks and benefits of food issues. These 6 pairs comprise of the original 4 pairs from the survey with two more

added. Also, to achieve a higher discriminative power we decide to expand the scale to a 7 point scale (totally disagree- totally agree).

Manipulation check

Finally, we added a manipulation check of 5 items asking participants the value and own practice of deciding based on rational arguments (primed by condition 1) or intuition (primed by condition 2), as well as included a question whether people learned Dutch before the age of 6. Three additional questions where added to estimate whether the priming procedure was obvious (Bargh and Chartrand, 2000; Riketta and Dauenheimer, 2003).

Procedure

Students were welcomed in the class room and given a computer. Students were not told prior to the experiment what its purpose was. Instead we introduced this experiment as two independent experiments in series of small experiments on consumer behaviour. Other short experiments by colleagues were added for to make this story even more convincing. The scrambles sentence task was introduced as a communication experiment in which we want to figure out how well message received in a garbled way could be understood. We deviate from the more usual cover story for this manipulation that addresses language ability (e.g. Bargh et al., 1996; Kay and Ross, 2003; Riketta and Dauenheimer, 2003) because it may be well known to the students that no language research is conducted at our university, while communication is an actual topic of research.

The second part (the independent) was introduced as an experiment about consumer behaviour. To enlarge the illusion that the study consisted of separate experiments the manipulations and the dependents and experiments of colleagues were programmed with different colour schemes, backgrounds and fonts.

Results

Again we found negative correlations between all pairs of risk and benefit perceptions (table 2.5).

Table 2.6 Correlations between food related risks and benefits (H1). N=97

No	Issue	Correlation risk-benefit (*r*)	*p* values (.05 is significant)
I	Consumption of chicken meat	-.144	$.16^{ns}$
II	Home preparation of chicken	-.131	$.20^{ns}$
III	Bacteria free meat	-.230	<.05
IV	Use of modern technologies to produce bacteria free meat	-.324	<.01
V	Buying meat close to sell-by-date	-.351	<.01
VI	Consuming fish	-.082	$.42^{ns}$
Average correlation		-.139	

Investigating the effect of the manipulation, we found a general tendency that the negative correlation was smaller for the cognition condition than for the affect condition.

However this effect was in general fairly small and became only significant in one out of six stimuli.

Table 2.7 Change in (negative) correlation between the affect first and the cognition first condition

No	Issue	Correlation risk-benefit (*r*)		Difference (affect-cognition)	Fisher Z-test
		affect (n=47)	cognition (n=50)		
I	Consumption of chicken meat	-.222	-.048	-.174	0.85
II	Home preparation of chicken	-.216	-.028	-.188	0.91
III	Bacteria free meat	-.164	-.313 b)	.149 c)	-0.75
IV	Use of modern technologies to produce bacteria free meat	-.494 a)	-.134	-.358	1.93+
V	Buying meat close to sell-by-date	-.379 a)	-.312 b)	-.067	0.36
VI	Consuming fish	-.021	-.140	.119 c)	-0.57
Average difference (aggregated n)				-.139	1.10^{ns}

a) Significant at $p<.01$; b) Significant at $p<.05$, $^{+}$ $p=.06$; c) Direction of effect contrary to hypothesis.

Discussion

This experiment further supported the affect heuristic hypothesis, however it still did not yield conclusive results. Although effect size tends to be a bit larger than in study 1, even fewer effects proved to be significant. This may be an indication that the manipulation was less successful than we had hoped, or that our expectations with regard to reduced noise due to homogenous groups of participants was less explicit than we hoped. This maybe partially caused because the sample size is about 10 times smaller than that in study 1 (hence the s.e. is about the square root of 10~3.2 times larger); but can of course also be an indication of the weakness of the affect heuristic concept.

Study 2b Explicit Assignment

As the results of study 2a were not conclusive, we decided to ask participants explicitly to use an intuitive or a deliberative judgement.

> Operational Hypothesis 1.2b: Explicitly asking participants to give an intuitive judgement to risks and benefits versus asking them to give a deliberative judgement increases the negative correlation between risk and benefit perception.

Methods

Participants were 80 students from Twente University. The instructions were 'please judge these intuitively, based on your feeling, use the first impression that comes to mind' - affect condition, or 'please judge these, while taking due account of any argument in favour or against you can imagine' - cognition condition. No scrambled sentences were added. For the rest the experiment is identical to study 2a.

Results

Once more we find consistent negative correlations between perceived risk and benefit (table 2.8).

Table 2.8 Correlations between food related risks and benefits (H1). N=80

No	Issue	Correlation risk-benefit (*r*)	*p* values (.05 is signify-cant)
I	Consumption of chicken meat	-.058	61[ns]
II	Home preparation of chicken	-.375	<.01
III	Bacteria free meat	-.258	.02
IV	Use of modern technologies to produce bacteria free meat	-.403	<.01
V	Buying meat close to sell-by-date	-.117	30[ns]
VI	Consuming fish	-.220	.05
Average correlation		-.133	

Once again we find a change in correlation between risk and benefit perception in the expected direction (effect weaker in cognition condition). However, once again the results show not to be conclusive (table 2.9).

Table 2.9 Change in (negative) correlation between the affect asked and the thought through asked condition

No	Issue	Correlation risk-benefit (*r*)		Difference (affect-thought)	Fisher Z-test
		affect (n=43)	cognition (n=37)		
I	Consumption of chicken meat	-.144	.158	-.302	1.30
II	Home preparation of chicken	-.467 a)	-.298	-.169	0.89
III	Bacteria free meat	-.231	-.327 b)	.096 c)	-0.45
IV	Use of modern technologies to produce bacteria free meat	-.477 a)	-.266	-.211	1.06
V	Buying meat close to sell-by-date	-.176	-.028	-.148	0.64
VI	Consuming fish	-.344	-.037	-.307	1.38
Average difference				-.174	2.19 b)

a) Significant at $p<.01$; b) Significant at $p<.05$; c) Direction of effect contrary to hypothesis.

Discussion

Concluding from these studies, if the affect heuristic exists, it is not easy to show that it is about affective processing of information. Different manipulation to prime affective versus cognitive processing results in corroborating data; however none of our test was conclusive. Added with the inconclusive results from the earlier experiment were time pressure was used to induce non-cognitive reasoning (Finucane et al., 2000); the relevance of affect as an easily triggered underlying construct of any practical relevance should be seriously be reconsidered. In the next study we will investigate whether other explanations such as prior experience or prior attitude are more successful.

2.2.3 Study 3: Experience and information use

The hypotheses 2.1a (habit), 2.1b (illness) and 2.1c (age) give an indirect account of experience. As already evident from the habit measure, such generic experience measures are not sufficient to tell the whole story. It is more likely that specific experience with specific products plays a more important role; or in other words, in cases with more experience, such experiential elements will determine risk and benefit perception to a larger degree.

> Operational Hypothesis 2.3a: More experience with specific food products will imply a stronger relation between prior attitude and risk benefit perception

On the other hand, if indeed prior attitude is an anchoring value such as stabilising reference values (Fischer & De Vries, submitted) then we would anticipate that for little known products the reference value at first is strictly based upon the previous encounter with that product. Or in this experiment we would say that the first of the pair of risk and benefit perceptions is more or less independent, but the second of the two will be based to a large extent on the ad-hoc attitude formed when judging the other.

> Operational Hypothesis 2.3b: The less experience with specific food products the more the first asked of the pair of risk and benefits will influence the ad-hoc attitude and thus the second of the perceptions asked.

For this aim we subjected participants to four food products of which a pilot study showed they were more, or less likely to be experienced with. These were apples (high experience fruit); star fruit (low experience fruit); raw herring (high experience fish); fugu (low experience fish). We measured participants risk and benefit perception, and compared correlations.

> Operational Hypothesis 2.3c: More experienced food products require fewer uses of cognitive cues, i.e. information retrieval

Participants were offered an information button, with the risk and benefit scales. If they pressed this button they got a small text on the product that contained both risks and benefits of the product.

> Operational Hypothesis 2.3d: For more experienced food products prior attitude is a more important predictor of posterior attitude

Prior attitude was measured on a 3 item scale, including 1 attitude strength measure. The influence of prior attitude on risk and benefit perception was compared to the high experience and low experience products.

Method and Design

This study had a 2(type: fish vs. fruit)x 2(knowledge: well known vs. unknown) within participant x 2(context: risk perception first vs. benefit perception first) between participant design.

Each participant received question about four products that varied on the within participant factors. They were asked about a well known fruit: the apple, a relatively little known fruit: the carambola (or starfruit), a well known fish: salmon, and a relatively little known fish: fugu (or Japanese blowfish). At the beginning of the experiment participants were asked after their attitude towards apple, carambola, fugu and salmon using a three item 7-point attitude scale (see appendix 3). For the prior attitude participants had the additional option 'I don't know'. After this prior attitude participants got about 15 minutes of different tasks as filler task. After these tasks participants were asked either asked to estimated the risks of a randomly chosen product out of the four products on a 7-point scale, followed by the benefits of the same product (risk first condition), or the benefit followed by the risk (benefit first condition). After both risk and benefit perception were given the other products followed in random order. While considering risks and benefits participants could use two information buttons to get more information about the risks and benefits of the product (see appendix 3). After these tasks participants were asked to scale their posterior attitude on the same 3 items as before, and were asked after experience, knowledge and intention to consumer each of the four products on single item 7-point scales.

Participants were 105 students of Wageningen University, 78 female, 27 male. The mean age was 21 years (minimum 17, maximum 28).

After entering one of four sessions in the experimentation room participants were allocated a computer. In sessions 1 and 4 all participants received the risk perception first condition (63 participants) in sessions 2 and 3 they received the benefit perception first condition (42 participants).

The concluded study took about 40 minutes. Participants received €3,- and a small gift product for their participation.

Results

The attitude scale was reasonably reliable (Cronbach α=0.64), and mean scores were calculated and used as single measure for prior and posterior attitude.

Several manipulation tests showed that the assumedly less known products were indeed little known (table 2.10). Much more participants used the 'I don't know' option for prior attitude for the unknown products ($\chi^2(3)=149$, $p<.001$). Repeated measures anova shows a significant effect of level of knowledge on previously having eaten a well-known product ($F(1,104)=506.5$; $p<.001$) and on knowledge of a well-known product ($F(1,104)=354.6$; $p<.001$).

Table 2.10 Manipulation check for study 3 (N=105)

Product	Assumed knowledge	Prior Attitude, chosen 'I don't know'	I have eaten product repeatedly before (-3:+3) Mean (SD)	I have knowledge about the properties of the product (-3:+3) Mean (SD)
Apple	Known	0 (0%)	2.4 (1.0)	1.0 (1.3)
Carambola	Unknown	37 (35%)	-1.2 (1.7)	-1.7 (1.5)
Salmon	Known	0 (0%)	1.0 (2.1)	0.2 (1.8)
Fugu	Unknown	80 (76%)	-2.2 (1.4)	-2.2 (1.3)

As before risk and benefit perception were negatively correlated over all four products (table 2.11).

Table 2.11 Correlations between food related risks and benefits in study 3. (N=105)

No	Product	Correlation Risk-Benefit (*r*)	*p* values (.05 is significant)
I	Apple	-.184	.06
II	Carambola	-.259	<.01
III	Salmon	-.203	<.05
IV	Fugu	-.448	<.01

Comparing these correlation coefficients we find that there is a less pronounced negative correlation between risk and benefit for the well known products (apple and salmon) as compared to the little known products (carambola and fugu). This is however only significant for the difference between apple and fugu (Fisher $Z=2.11$; $p<.05$) and between salmon and fugu (Fisher $Z=1.97$; $p<.05$).

Next we investigate the relation between prior attitude and risk and benefit perceptions.

Using regression analyses we find that especially for benefit perception prior attitude influences benefit perception for well known products, while the direct context influences that of little known products (table 2.12).

To substantiate this finding we considered all cases as independent and conducted a MANOVA in which we investigated the main effects of knowledge, context and prior attitude on risk and benefit perception; as well as the interaction between knowledge and context and knowledge and prior attitude. We did indeed find a significant three way interaction between knowledge level, immediate context and prior attitude for benefit perception ($F(3, 413)=6.9$; $p<.01$) but not for risk perception ($F(3, 413)=1.2$; $p=.30$).

Table 2.12 Effect of prior attitude and immediate context on risk and benefit perception. (N=105)

Prior attitude	Predictor	Risk perception			Benefit perception		
		t	β	*p*	t	β	*p*
Apple	Prior attitude	1.05	-0.10	.30	4.00	0.37	<.001**
	Context	0.15	-0.02	.88	1.74	0.16	.09
Carambola	Prior attitude	0.73	-0.07	.47	1.77	0.16	.08
	Context	1.73	-0.17	.09	4.8	0.42	<.001**
Salmon	Prior attitude	2.09	-0.20	.04*	10.35	0.71	<.001**
	Context	0.42	0.04	.68	0.96	0.07	.34
Fugu	Prior attitude	1.27	-0.12	.21	1.05	0.10	.21
	Context	2.53	-0.24	.01**	4.48	0.40	<.001**

Furthermore we investigate the influence of context, and prior knowledge on risk and benefit perception with a repeated measures ANOVA and find that in general participants with prior knowledge of a product estimate the risk 0.98 scale point lower (on a 7-point scale; $F(1,103)=49.4$, $p<0.001$), while they estimate the benefit of these products 1.08 scale point higher ($F(1,103)=80.5$, $p<0.001$). For both perceptions there is a significant interaction between knowledge level and context (risk perception $F(1,103)=5.8$, $p=.02$; benefit perception $F(1,103)=15.5$, $p<.001$) confirming that the context differentially influences risk or benefit perceptions of well known versus unknown products (see figure 2.10). The type of product, fish or fruit showed no interaction with the context effect (risk perception $F(1,103)=0.05$, $p=.83$; benefit perception $F(1,103)=0.16$, $p=0.69$).

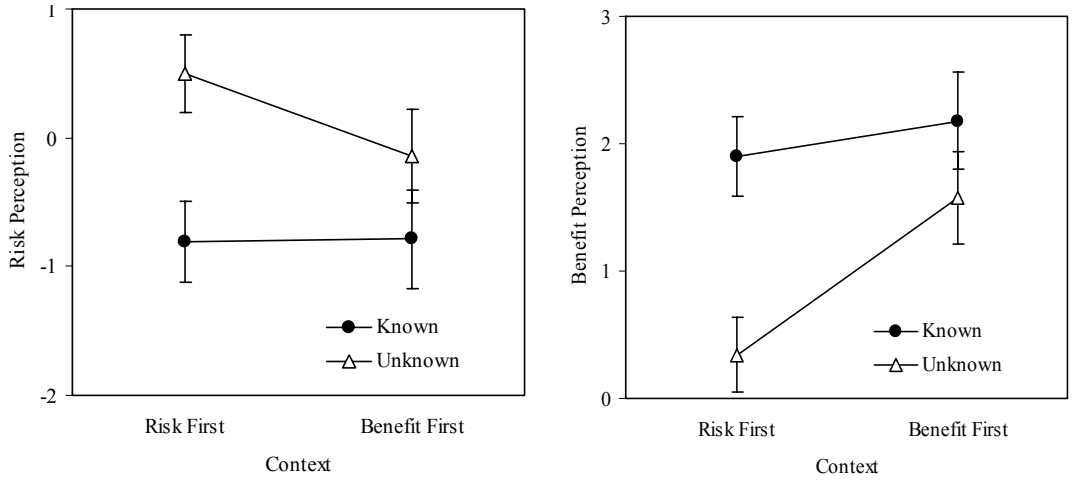

Figure 2.10 Interaction between recent context and knowledge on risk and benefit perception (error bars indicate 95% confidence interval)

We also find that participants use information less frequently for the apple (79 times) and the salmon (86 times) than for the carambola (118 times) and the fugu (121 times). The unknown products lead to more frequent information retrieval ($\chi^2(3)=13.9$, $p<.01$). Furthermore, the time used per instance of information retrieval is shorter for the 68 participants who retrieved information about known products (M=4.8 second) than for the 88 participants that retrieved information for the little known products (M=6.4) second. This difference is significant for the 68 participants that used information on both product (paired sample $t(67)=4.6$, $p<.001$). When we control for the use of information the result presented in table 2.12 remain the same; with a larger role for prior attitude for the well known products (see appendix 4), or in other words, even when information is used it is used to a larger extent for unknown than for well-known products.

To investigate the relation between prior attitude and posterior attitude.

Table 2.13 Effect of prior attitude and immediate context on risk and benefit perception. (N=105)

Prior attitude	Predictor	Posterior attitude		
		F	R^2	*p*
Apple	Prior attitude	70.0	0.40	<0.01
Carambola	Prior attitude	19.5	0.16	<0.01
Salmon	Prior attitude	406.3	0.80	<0.01
Fugu	Prior attitude	18.4	0.15	<0.01

Discussion of study 3

In this study we do indeed show that for products where participants have more experience, a prior attitude determines benefit perception. There was also some evidence that this is the case for risk perception, however this is not conclusive.

On the other hand for product with little experience the context, the question to deliberate on risk determines benefit perception. This primacy effect (Gellynck et al., 2006) or some kind of context effect for product without prior attitude (Van den Hoogen et al., 2006) is not only shown through the repeated measures ANOVA but is also manifests itself as a higher value of the negative correlation between risk and benefit. This effect can be considered as a partial replication of the effect in the second experiment of Finucane's paper (2000). In relation to the computational approach to reference values (Fischer et al., 2005) this effect can be interpreted as the construction of an ad-hoc attitude based upon the risk perception (or the benefit perception) that then influences the subsequent measure. On the other hand, if a participant has prior experience and knowledge the existing prior attitude is not so easily changed and remains the dominant cause for the complimentary measure.

That this is a heuristic process is supported by the lower information need for well-known product, as not only did participants request information for well-known products less frequently, even when they did so, they spent less time evaluating it, and it subsequently influenced their risk or benefit perception to a lower degree. This is consistent with Fischer and De Vries (submitted) idea about feedback of experience and new information onto decision criteria. It also provides partial evidence for the associative view of risk and benefit perception (Eiser et al., 2002) with the caveat that new information

will feed back into the associations. For new products additional information will be more influential, which will initially deliver results closely mimicking a causal relationship of risk and benefit information on their perceptions (cf. Siegrist, 2000). Finally we also found the almost trivial evidence that prior attitude rather is a better predictor for posterior attitude for well-known products.

2.3 General discussion

In this paper the affect heuristic is reviewed in different studies. The paper replicated the early findings on the affect heuristic. However, we noted that these are neither very robust nor large. As in previous studies induction of processing style was only partially successful (studies 1 and 2). However the formation of ad-hoc attitude, or affect was once again convincingly shown (study 3). In study 1 we found evidence that general personal food experience, and in study 3 we found more conclusive evidence that specific food experience influences risk and benefit perceptions in a way consistent with heuristic processing of information. In study 3 we did however find that lack of knowledge did not as much lead to more elaborate investigation of the information, but rather to the formation of an ad-hoc attitude, that was subsequently used for a heuristic judgement on the second of the pair of risk and benefit questions. Although we acknowledge that these processes indeed point at a heuristic, the important influence of experience and prior attitude raises the question whether this is necessarily strictly affect. The results as we find them are most easily explained by a bootstrapping feedback process that feeds all experience into an evermore stable reference framework (Fischer et al., 2005). These reference values are arguably emotional in nature, and are likely to form an emotional expectation like somatic markers. However, whether affect towards an object or a more generic term such as prior attitude, which also includes feelings is the most concise term is not so easily determined. Furthermore, interpreting these results in the context of dual-process models implies that heuristic processing takes the upper-hand, even when little to no implicit information is present. Apparently consumers are quickly ready to heuristically judge the product as a whole, even when little information is present. This may be an explanation why several manipulation to reduce elaborate processing (Finucane et al., 2000) or to prime more heuristic processing (this paper) were not very successful. It may be the case that the heuristic processing is the standard rather then a special case. Thus, for future research we recommend to increase motivation and the likelihood of elaborate processing rather than to try to increase heuristic processing. Due account has to be taken also of the role of personal experience as both more experience participants are most likely to stay with the heuristic process (study 1) as well as a high level of prior knowledge about specific products results in a balanced and stable judgement based on prior attitude (study 3). Practically this means that for well established products and people, additional information will be added to their decisions base, and that these people and products are likely not to be disturbed too much by new information, not even food scares. However, for inexperienced people and for new products the first bit of information will likely determine the setting for much of its future. Therefore these groups of people and products may be the most interesting focus of

investigation for the launch of new products, or for information campaigns on existing products.

2.4 Conclusion

We replicate the findings of previous affect heuristic studies. Heuristic rather than elaborate processing of information is likely to be the standard situation. Prior experience was shown to play an essential role in understanding both interpersonal differences and differences in risk and benefit perception of products. For future development of these ideas, personal experience and the feedback of information into the affective evaluation criterion may be the best way forward.

3. Showcase 2: Household differences in the response to food-safety incidents[1]

Marcel Kornelis[2]

3.1 Introduction

Product crises can be disastrous for both firms and consumers. Firms may loose revenues, consumers may loose confidence in the product quality, and, the worst of all cases, the crisis may jeopardise public health. It is expected that product crises will occur more frequently, because of the increasing complexity of products, the closer scrutiny by firms and public-policy makers, and the higher demands of consumers (Dawar and Pillutla, 2000). Product crises usually obtain substantial media coverage, and the information flow to the general public can have a dramatic effect. For instance, after the press release that a BBC documentary would report produced-salmon contamination, the stock market quotation of world's largest salmon producer (Nutreco) dropped by 6.1% (Reuters News Service, 2001). Not only stock brokers, but also consumers may respond very fast to a product crisis, however, not every consumer may react equally quickly or equally strong. Indeed, Pennings et al. (2002) showed significant differences in the reactions of German, Dutch, and American consumers to the infamous mad-cow disease (or: BSE) crisis.[3] Whereas many studies have investigated differences in consumer response to marketing mix variables, surprisingly little research has been done on the differences in consumer response to a product crisis.

In this paper, we focus on the steady-state (i.e. after the initial dust has settled)[4] response of distinct consumer groups to a product-crisis. Consumers may respond very differently, as they may have different risk perceptions about the crisis or, when price effects are involved, re-allocate their budgets differently. We develop an intervention model that allows for crisis-induced changes in the steady-state response patterns of consumers. We argue that the dates at which crises start to affect the consumption patterns of consumers may be hard to determine outside the model, as not all consumers may respond equally fast to the beginning and/or the end of the crisis, so that lagged effects may exist. Therefore, we adopt a methodology in which the change dates are not *a priori* known. In addition, we account for *all* permanent trend breaks in a market. This is important, as the markets under consideration may have experienced *multiple* major

[1] A slightly modified of this section will be submitted for publication in an international scientific journal.

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[3] BSE is the abbreviation of Bovine Spongiform Ecephalopathy.

[4] See e.g. Dekimpe and Hanssens (1999) or Pauwels, Hanssens and Siddarth (2002) for a similar conceptualisation.

events, several of which could have affected the consumers. Ignoring these other events may well bias one's inferences on the impact of the crisis.

We apply the proposed methodology to the Dutch consumer-market for chicken-meat in the period of 2000 to 2004, where a key event was the bird-flu crisis of February and March 2003. The announcement that avian influenza was discovered caused a huge media attention in the Netherlands. We employ four-weekly data (2000:01 to 2004:13) on the chicken-meat consumption of different consumer household-groups in the Netherlands as collected by GfK. We investigate whether this bird-flu crisis had steady-state consequences for the consumption of chicken meat among the consumer groups.

3.2 Responses to product crisis

Van Heerde et al. (2005) distinguish three main research streams on the impact of product crises in a market: descriptive studies, controlled lab experiments, and the impact of actual crises on performance measures. Our study is situated in the third research stream, as we investigate the steady-state implications of a crisis on consumer response. However, unlike previous studies, we (i) empirically determine the most appropriate breakpoint to allow in a flexible way for potential lagged effects, and (ii) account for the potentially confounding effects of other events in the market.

First, the timing of a product crisis does not necessarily coincide exactly with observed changes in the consumption patterns. It may take some time before a crisis affects the behaviour of *all* consumers in the market, e.g. due to differences in information acquisition. For instance, consumers may have different preferences for different sources of information (Kornelis et al., 2006a), which may not only include government, academic or industry (Gordon, 2003; Siegrist and Cvetkovich, 2001), but also social networks, such as friends and family (Burger and Waishwell, 2001; Verbeke and Vackier, 2004). Among the consumers, this may not only lead to different perceptions about the crisis, but also to different response rates. Moreover, when the crisis creates a supply effect, i.e. a price adjustment or a change in the marketing spending, this, in its turn, may also affect the behaviour of consumers at later points in time.

Second, we account for the potentially confounding effects of *other events* in the market. This is needed, as the crisis of focal interest is usually not the only major event occurring in a market. In the past decade, markets for consumer goods have faced a substantial number of major events that may have permanently changed the market outlook, e.g. the introduction of the Euro, the adoption of new food technologies, or price warfares between supermarkets. Given the context of our empirical analysis (the bird-flu crisis), we can also think of a number of food safety incidents, such as the BSE-crisis, or the Medroxy Progestrone Acetate (MPA) hormone in animal feed. These events were often associated with a huge media attention. To properly assess the impact of the key event of interest, one should control for these other events.[1]

[1] Illustrative examples about consumer reactions to food-scares are given in appendix 5.

3.3 Methodology

In line with recent literature in both economics (see e.g. Ben-David and Papell, 2000; Perron, 1989) and marketing (see e.g. Nijs et al., 2001; Steenkamp et al., 2004), we investigate the steady-state impact of major events by identifying so-called structural breaks in the data, which are defined as parameter changes in the deterministic part of the model, i.e. the slope and/or the intercept of the deterministic growth path.[1] This approach is consistent with the intervention-analysis approach of Box and Tiao (1975), in that unique historic events are separated from the regular noise function (Perron, 1994).

Our proposed structural-break methodology consists of a series of steps, as outlined below. Following common practice, we first test for the stationary versus evolving nature of the series of interest (Dekimpe and Hanssens, 1995, 1999; Pauwels and Srinivasan, 2004). We apply the well-known Augmented Dickey Fuller (ADF) unit-root test procedure, as described, for example, in Enders (1995, p. 257), to check the evolution of the time series. In the procedure, we start with the most general unit-root test equation:

$$y_t = \mu + \beta t + a y_{t-1} + \sum_{s=1}^{S-1} b_s d_{st} + \sum_{j=1}^{J} \pi_j \Delta y_{t-j} + u_t, \; t = 1,...,T, \qquad (1)$$

where y_t is the (log-transformed) variable of interest, i.e. chicken-meat consumption, μ a constant, and t a deterministic trend variable. The seasonal dummy variable d_{st} takes the value one in season s and zero otherwise. The presence of seasonal dummies in (1) does not affect the critical values of the unit-root test (Ghysels & Perron, 1996). u_t represents a random disturbance term, μ, β, a, b_s, and π_j are parameters, and Δ is the difference operator ($\Delta y_t \equiv y_t - y_{t-1}$). J lagged first differences are included to ensure that u_t is white noise.[2]

It is well established (see e.g. Perron, 1989; Zivot & Andrews, 1992) that a failure to account for a structural break biases traditional unit root tests towards nonstationarity. So, if the ADF-test indicates that the investigated series is evolving, it may be due to misspecification. Therefore, when the series is found to be evolving, we apply unit root tests that explicitly allow for the existence of a structural break in the deterministic part of the model. Two types of structural-break tests can be considered, depending on the amount of prior knowledge on the location of the break point, viz. exogenous versus endogenous break tests. In the tradition of Perron (1989), one assumes that researchers exactly know the date of change, which therefore can be imposed exogenously. As a consequence, possible lead (anticipation) or lagged (delayed) effects tend to be ignored. The a priori imposition of a change date has been criticised from a statistical point of view as well. Selecting the most suitable change date out of a list of potential break locations is presumably influenced by 'pre-testing' the data. Therefore, the researchers' choice must be viewed, at least to some extent, as being correlated with the data. Such a correlation affects

[1] This section is partly based on Kornelis et al. (2006b).

[2] We apply the procedure of Perron (1989) for the determination of the maximum number of lags (J).

both the finite-sample and asymptotic distributions of the relevant test statistics, and may influence the unit-root test outcome (see, among others, Christiano, 1992; Perron, 1994; Zivot and Andrews, 1992).

We therefore opt to let the test identify the most appropriate break point, and consider endogenous-break unit-root tests that allow for a structural break at an unknown point in time (Zivot and Andrews, 1992; Kapetanios 2005). Allowing for only *one* structural break in the data presumes (by definition) an *irreversible* change in the markets structure (Papell and Prodan 2003), and since many food-safety incidents not only have a beginning but also an end, we follow Lumsdaine and Papell (1997) who allow for *two* breaks in the unit root test, so that our test is consistent with potentially transitory events. In the approach of Lumsdaine and Papell (1997) one *repeatedly* estimates, for each possible break date, the following equation:

$$y_t = \mu + \beta t + \left[\theta_1 f(\hat{t}_1) + \gamma_1 g(\hat{t}_1) + \theta_2 f(\hat{t}_2) + \gamma_2 g(\hat{t}_2)\right] + a y_{t-1} + \sum_{s=1}^{S-1} b_s d_{st} + \sum_{j=1}^{J} \pi_j \Delta y_{t-j} + u_t, \qquad (2)$$

with $\hat{t}_1$ and $\hat{t}_2$ taking all possible break dates.[1] The dummy variable $g(\hat{t}_m)$ has the value $t - \hat{t}_m$ if $t > \hat{t}_m$ and 0 otherwise, for $m = 1,2$. The dummy variables $f(\hat{t}_m)$ has the value 1 if $t > \hat{t}_m$ and 0 otherwise, for $m = 1,2$. They denote two structural breaks in the slope and intercept at time $\hat{t}_1$ and $\hat{t}_2$, respectively. θ_1, θ_2, γ_1, and γ_2 are parameters.

Following traditional unit-root tests, one has to determine whether *a* is significantly smaller than one. However, we now have obtained a *list* of estimates for *a*, rather than a single estimate, since we estimated this parameter for all possible change date locations $\hat{t}_1$ and $\hat{t}_2$. We select the one with the most negative *t*-value (denoted as inf-$\hat{t}$) out of this list. This coefficient maximises evidence against the unit-root hypothesis. When the value of *a* is significantly smaller than one, the series is found to be stationary, and the corresponding change dates ($\hat{t}_1$ and $\hat{t}_2$) give the estimated positions of the (first two) structural breaks. Equation (2) can then be rewritten as:

$$y_t = \mu + \beta t + \theta_1 f(\hat{t}_1) + \gamma_1 g(\hat{t}_1) + \theta_2 f(\hat{t}_2) + \gamma_2 g(\hat{t}_2) + \sum_{s=1}^{S-1} b_s d_{st} + \sum_{j=1}^{J+1} \pi_j y_{t-j} + u_t, \qquad (3)$$

γ_1 and γ_2 then give the immediate effects on the slope of the series. However, because of the autoregressive nature of the data-generating process, both parameters do not yet give the full steady-state impact. It can be shown that the long-run impact on the series' growth rate is given by $\gamma_{LR,m} = \gamma_m / \left(1 - \sum \pi_j\right)$ (see, e.g. Ben-David and Papell, 2000, or

[1] Theoretically, one could consider the whole sample as the set of possible break dates. It is, however, advisable to leave out the beginning and end of the sample when repeatedly estimating equation (1), i.e. to do so in the interval [0.15*T*, 0.85*T*] (Perron 1994, p. 136).

Deleersnyder et al., 2002 for a marketing application).[1] Depending on the sign of this ratio, the series' pre-event long-run growth rate of $\beta_{LR} = \beta/\left(1-\sum \pi_j\right)$ is either reduced or increased. In the absence of a significant effect on the growth of the series, we can derive in a similar way whether the event of interest caused an immediate (θ_m) or permanent $\left(\theta_{LR,m} = \theta_m/\left(1-\sum \pi_j\right)\right)$ level shift.

However, as indicated before, there may exist other major events that permanently altered the underlying data-generating process. To derive the timing of a third break date, we follow the iterative process of Ben-David and Papell (2000), which is quite similar to the unit-root test procedure of Lumsdaine and Papell (1997) as presented in equation (2), but searches for one additional break conditional on the breaks that are already identified. Specifically, we repeatedly estimate for each different location of $\hat{t}_3$:[2]

$$y_t = \mu + \beta t + \sum_{m=1}^{2}\left[\theta_m f(\hat{t}_m) + \gamma_m g(\hat{t}_m)\right] + \left[\theta_3 f(\hat{t}_3) + \gamma_3 g(\hat{t}_3)\right] + \sum_{s=1}^{S-1} b_s d_{st} + \sum_{j=1}^{J} \pi_j y_{t-j} + u_t, \qquad (4)$$

and compare its performance with the two-break model (3) by means of the so-called supWald (or supF) test of Ben-David and Papell (2000), which can be written as:[3]

$$W(\hat{t}_3 \mid \hat{t}_1, \hat{t}_2) = (T-\eta)\frac{SSR(\hat{t}_1, \hat{t}_2) - SSR(\hat{t}_3)}{SSR(\hat{t}_3)}. \qquad (5)$$

In (5), $SSR(\hat{t}_1, \hat{t}_2)$ is the sum of squared residuals under the null hypothesis, i.e. the model with two structural breaks, $SSR(\hat{t}_3)$ the sum of squared residuals of the alternative model that includes three structural breaks, and η is the number of parameters of the alternative model. In determining $\hat{t}_3$, we condition on the presence of $\hat{t}_1$ and $\hat{t}_2$. Out of the obtained list of estimates for the third break location, we choose that $\hat{t}_3$ for which the value of $W(\hat{t}_3 \mid \hat{t}_1, \hat{t}_2)$ is maximal. This results in the maximum evidence in favour of the existence of a third break. If its value exceeds the associated critical value, the null hypothesis is rejected, and we include the third break into the model (see Ben-David and Papell, 2000, table 3.1, for the critical values).[4] Following Ben-David and Papell (2000), we require that the location of the third break should not be too close to the first two. In our setting, the third break is separated from the first and second by at least six months.

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[1] By using the term 'long-run' as an equivalent for 'steady-state', we follow a substantial number of authors in the field of marketing (including Dekimpe and Hanssens 1999, Deleersnyder et al. 2002, and Nijs et al. 2001) and in economics (including Zivot and Andrews 1992; (Perron and Vogelsang 1992); Ben-David and Papell, 2000).

[2] In (4), J is once again derived using Perron's procedure.

[3] Note that, when the test value of (5) is divided by the number of restrictions under the null hypothesis, it will correspond to the standard F-statistic (see Judge et al., 1985, pp 186-187).

[4] Note that if the break dates are a priori imposed, (5) becomes the traditional Wald test (Wald, 1943).

For a model with three breaks, a similar procedure is adopted to determine whether a fourth structural break should be added to the model. Specifically, we apply the supWald test, now with three breaks under the null, and four breaks under the alternative hypothesis. Again, the fourth break is separated from the first, second, and third by at least six months. We continue this procedure of searching for additional breaks until the supWald test fails to reject the null hypothesis of 'no additional structural break.' This constitutes our stopping rule. In general, the procedure determines a total number of $\hat{M}$ breaks, resulting in:

$$y_t = \mu + \beta t + \sum_{m=1}^{\hat{M}} \left[\theta_m f(\hat{t}_m) + \gamma_m g(\hat{t}_m)\right] + \sum_{s=1}^{S-1} b_s d_{st} + \sum_{j=1}^{J} \pi_j y_{t-j} + u_t \,. \qquad (6)$$

It is still possible that the series is found to be evolving, even after the explicit allowance for two breaks. Up to our knowledge, there does not exist a unit-root test procedure that jointly includes three structural breaks in the test equation. However, (Kapetanios 2005) provides an endogenous structural-break unit-root test up to five breaks following a similar strategy as in Ben-David and Papell (2000). In his procedure, one sequentially adds (endogenously determined) structural-break dummies to equation (1) until the series is found to be stationary. Notice, however, that if the number of breaks grows, the distinction between stationarity and evolution becomes clouded (see Ben-David and Papell, 2000).[1]

In that case, we remove the underlying stochastic trend by taking the first difference (see, for a similar practice, Deleersnyder et al., 2002; Nijs et al. 2001). For a model in differences, one could follow a similar search procedure in the tradition of Ben-David & Papell (2000) to find a priori unknown break dummies, hereby using the critical values in Bai and Perron (1998, table 3.1) for non-trending variables.

Sen (2003) demonstrated that, when the form of the breaks are a priori unknown, the most general model in which both trend and intercept exhibit a break is superior to the other possibilities. We therefore apply this most general model to obtain the maximum number of breaks. Since we thus jointly test for additional breaks in both the intercept and trend slope, it is possible that either one of the two associated parameters is significant, while the other is insignificant. We follow the procedure of Ben-David and Papell (2000) to remove insignificant dummy variables. In doing so, we profoundly investigate the form of each structural break.

In sum, while our approach follows Nijs et al. (2001) and Deleersnyder et al. (2002) in that we use structural-break time-series econometrics to quantify the steady-state impact of market introductions, we extend their methodology in two ways: (i) the explicit allowance for multiple breaks, and (ii) the unknown timing of these breaks.

[1] To find endogenous breaks in evolving series, one could remove the underlying stochastic trend by taking first differences, and then follow a search procedure in line with Ben-David and Papell (2000), hereby using the critical values of Bai and Perron (1998, table 2) for non-trending variables.

3.4 The Dutch market for chicken meat

We consider the Dutch market for chicken-meat consumption in the period of 2000 to 2004, when consumption expenditures grew to a market size of €452 million (current prices). The Netherlands is a highly-developed, industrialised country, similar to European countries such as Belgium, France or Germany, both in terms of their stage of economic development and in terms of their media landscape (Steenkamp et al. 2005).

A key event for chicken-meat consumption was the bird-flu crisis that started at the end of February 2003 and ended in July 2003 (*De Telegraaf*, 2003; *Algemeen Dagblad* 2003).[1] The announcement that avian influenza was discovered caused a huge media attention in the Netherlands, and over thirty million birds were (precautionary) culled. Apart from the bird-flu crisis, there were other major events in this and related markets, several of which are indicated in figure 3.1. For chicken meat, we observe several media-messages on antibiotics contamination, the publications of a report on salmonella and campylobacter contagion, and the discovery of Nitrofen contamination of fodder wheat (see *Trouw,* 2002). With respect to beef meat, there is the well-known fear for the linkage between BSE and Creutzfeld-Jacob disease (November 2000, see *Trouw* 2002). For the pig meat market, the foot-and-mouth disease of 2001 was a major crisis. It started in February 2001 in the UK, and in June 2001, newspapers reported the end of the crisis in the Netherlands (*De Telegraaf*, 2001), although new cases were identified in the UK in September 2001 (*De Financieel-Economische Tijd*, 2001). In july 2002, the Dutch authorities discovered a MPA contamination in several occasions (*Trouw*, 2002). In January 2001, a BBC-broadcasted documentary reported produced salmon contamination (*Het Financieele Dagblad*, 2001). Other economic events include a tax rise for meat, fish, fruit and groceries in the beginning of 2001 (*Algemeen Dagblad*, 2001), and a price cut for fish, fresh fruit and vegetables in the end of 2001 (*De Financieel-Economische Tijd*, 2001), particularly for salmon (*Het Financieel Dagblad*, 2001), the introduction of the Euro in January 2002 (*NRC Handelsblad*, 2002), a rise in unemployment in the end of 2002 and the beginning of 2003 (*NRC Handelsblad*, 2003). In October 2003, the Dutch supermarkets started a price-warfare to attract customers (*Het Parool*, 2003). As aforementioned, our methodology is flexible enough to account for the potentially confounding effects, if any, of these additional events.

We employ four-weekly data on total chicken-meat consumption in the Netherlands for the period from 2000:01 to 2004:13 as collected by GfK, so we have a time series sample that contains sixty-five observations. This period is in line with the sample length of four to five years of recent micro-level time-series studies on the steady-state behaviour of marketing variables (Dekimpe and Hanssens, 2004). In figure 3.1, we give the association between the observation number and the dates of the major events in parentheses.[2]

[1] This type of avian influenca was caused by the H7N7 virus.
[2] Additional background information about the bird-flu crisis is given in appendix 6.

	Major events
Chicken market	Antibiotics (May 2000; t=17,18), Salmonella and campylobacter (May 2002;t=31,32), Nitrofen (May 2002;t=31,32), Bird-flu crisis (February/March 2003;t=42)
Beef market	Creutzfeldt-Jacob disease (November 2000; t=11,12)
Pig market	Foot-and-mouth disease crisis (February to June 2001; t=15-19), Foot-and-mouth disease crisis (September 2001; t=22), MPA (July 2002; t=33,34)
Fish and seafood market	Alleged contamination (January 2001; t=14)
Other	Euro introduction (January 2002; t=28), economic decline (Beginning of 2003; t=38), price warefare (October 2003; t=52)

Figure 3.1 Major events

We analyse the dynamics of five chicken-market segments which are based on the age of the housewife in the household. Analysing segments may provide a more detailed picture of the market dynamics with respect to the event of focal interest (bird-flu crisis, in our setting), and age may be an important potential discriminating factor with respect to food safety issues (Verbeke et al., 2000). For the five consumer groups, we analyse both the quantities, as expressed in thousands of kilograms, and the revenues, as expressed in Dutch Guilders (NLG). The revenue metric facilitates a comparison of the findings across different consumption markets. Moreover, revenue generation has been argued to be a more relevant business goal to managers than mere volume creation (Srinivasan, Pauwels, Hanssens and Dekimpe, 2004, p. 618). However, the identification of potential structural breaks in both the revenues and quantities may provide a more detailed picture of the chicken-meat market dynamics. More specifically, when they are used in combination, they may give some important insights (although, indirectly) in the market's average price level. In addition to the five consumer groups, we also analyse the total chicken-meat consumption, so that we can check the aggregated effect. We take logarithms of the variables to reduce potential heteroscedasticity (Deleersnyder et al., 2002). Moreover, the first difference of the log-transformed series is a good measure for the growth rate of the original variable (Franses and Koop, 1998).

3.5 Empirical findings

We first establish the stationarity of the series of interest through structural-break unit-root tests. The outcomes of the ADF-test reveal that elderly housewives have more stable consumption patterns than the younger generations, as both the revenues and volumes of the housewives between the age of fifty and sixty-five, and of sixty-five and older are trend stationary, as presented in table 3.1. If we allow for two breaks, all series are found to be stationary at the 5% level, as presented in table 3.2. In the case of housewives of thirty and younger, the double-break unit root test indicates a structural break in period 44 for both the revenues and the volume series, which coincides with the bird-flu crisis (42), albeit with a small (2-period) lag. The test also suggests a break in periods 27 and 28, for the volumes and revenues, respectively. This break corresponds to the introduction of the Euro in January 2002. For the housewives between the age of forty and fifty, the double-break

unit-root test indicates a break date that can be related to the officially announced end of the bird-flu crisis (period 47). The remaining variables exhibit breaks at other locations. In sum, each of the market segment series is found to be trend stationary after controlling for two structural breaks.

Table 3.1 The unit-root test results for the consumer groups

Series	Test result
Revenues	
Thirty and younger	-1.55
Between thirty and forty	-2.42
Between forty and fifty	-3.10
Between fifty and sixty-five	-4.27
Sixty-five and older	-5.06
Volumes	
Thirty and younger	-1.44
Between thirty and forty	-1.77
Between forty and fifty	-1.94
Between fifty and sixty-five	-4.95
Sixty-five and older	-4.92

Bold figures indicate significance at the 5% level, for which the critical value is -3.45 (see Dickey and Fuller, 1981).

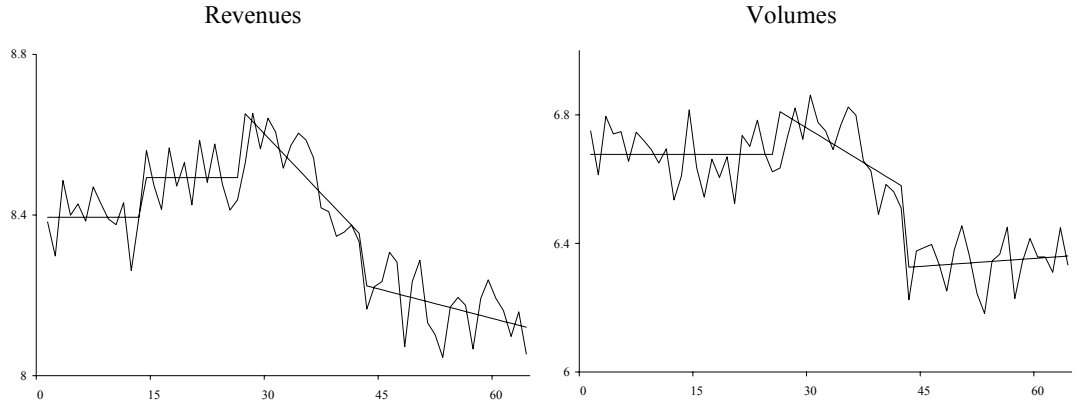
As outlined in the methodology section, additional breaks can still be present in the trend stationary series, even if the unit-root test already indicates a double break in the data. We therefore apply the multiple-break test of equation (6) to all trend-stationary variables. For the revenues series, we find additional breaks in the consumption patterns of housewives below thirty, between fifty and sixty-five, and of sixty-five and older as displayed in table 3.3. Additional breaks for the volume series are found in the groups with housewives between thirty and forty, and between forty and fifty. In one of these instances, i.e. housewives between thirty and forty, the multiple break test gives a break date that can be associated to the end of the bird-flu crisis (t=48). It is worth noting that all the found breaks have considerable face validity.

Table 3.2 The results of the double-break structural-break unit root test

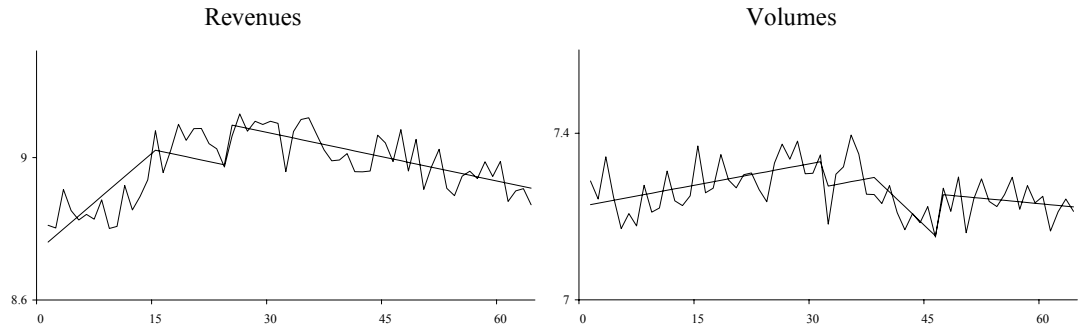
Series	Test result	Date	Event
Revenues			
Thirty and younger	-6.89	28	Introduction of Euro
		44	Bird-flu crisis
Between thirty and forty	-6.85	17	Foot-and-mouth disease
		26	Introduction of Euro
Between forty and fifty	-6.99	20	Foot-and-mouth disease
		33	Salmonella, campylobacter, and nitrofen
Volumes			
Thirty and younger	-6.89	27	Introduction of Euro
		44	Bird-flu crisis
Between thirty and forty	-6.87	33	Salmonella, campylobacter, and nitrofen
		40	Economic decline
Between forty and fifty	-7.08	37	Economic decline
		47	End of bird-flu crisis

Bold figures indicate significance at the 5% level. The critical value for the double-break unit-root test is -6.82 (see Lumsdaine and Papell, 1992).

To visualise the empirical findings, we superimpose the significant breaks and their locations, after which we fit the associated broken trend lines on the data by using ordinary least squares. The results are graphically depicted in figure 3.2. Three cases can be identified. First, the chicken-meat consumption of housewives of thirty years and younger shows a drop which can be related to the bird-flu crisis, and this drop occurs both in the volumes as well as in the revenues (figure 3.2, Panel A). This implies that the drop in demand is not completely offset by an opposite price effect. Second, the groups for which the housewives are between thirty and forty, and between forty and fifty, show a positive level break in the volumes when the end of the bird-flu crisis is present (Panels B and C). This break, however, is completely offset by an opposite price effect, as the revenues of these two groups do not exhibit a structural break that can be attributed to the bird-flu crisis. Finally, the housewives between fifty and sixty, and above the age of sixty-five, do not respond to the bird-flu crisis at all, neither in the volumes nor the revenues (Panels D and E).

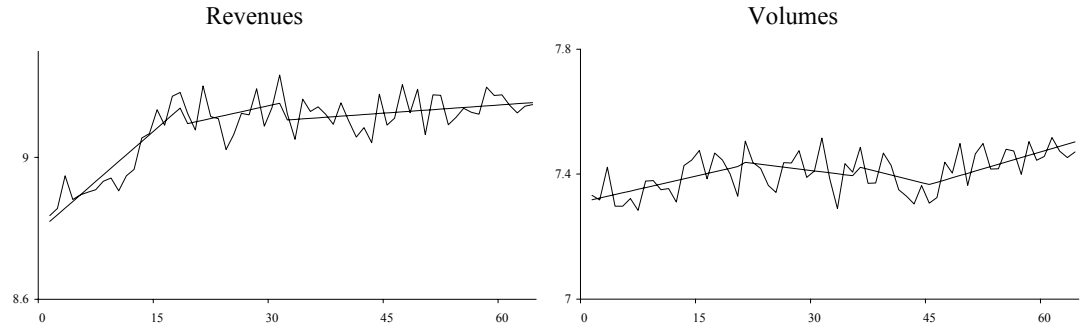


A. Housewives of thirty and younger

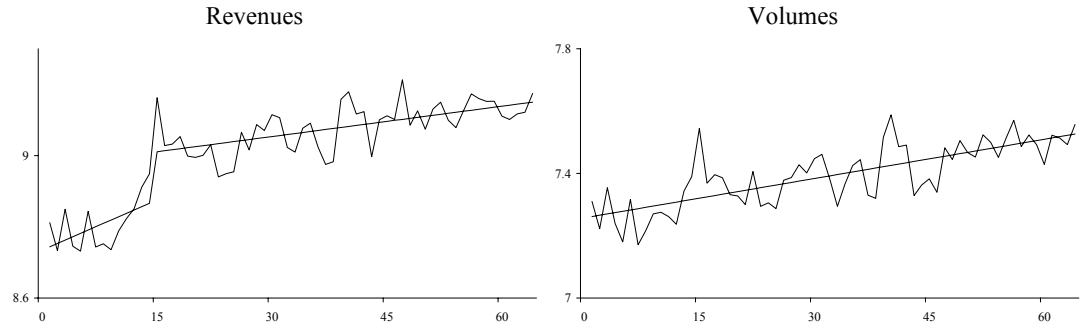


B. Housewives between thirty and forty

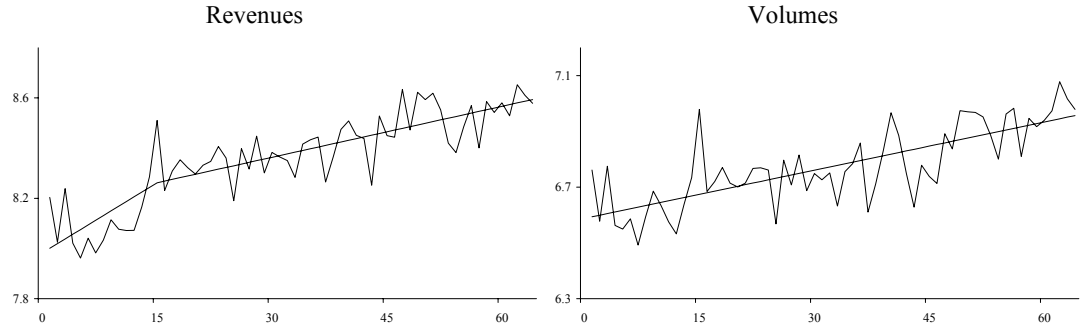
Figure 3.2 Chicken meat consumption; where the broken straight line is a fitted trend, and the fluctuating line is the log of chicken-meat consumption



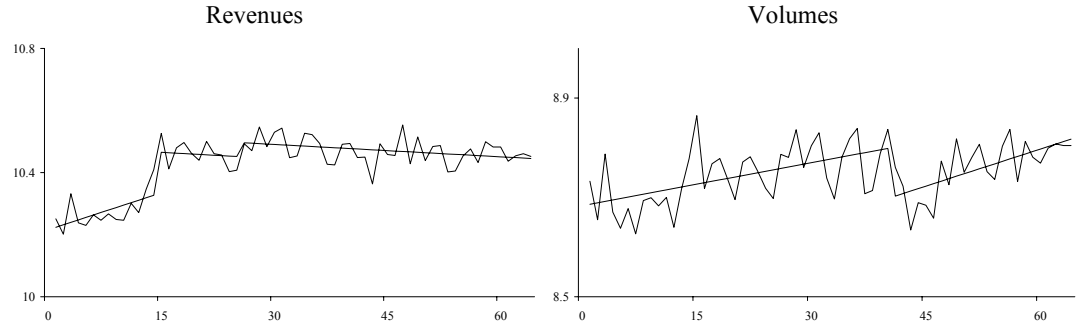
C. Housewives between forty and fifty



D. Housewives between fifty and sixty-five



E. Housewives of sixty-five and older



F. Total chicken-meat consumption

Figure 3.2 (continue) Chicken meat consumption; where the broken straight line is a fitted trend, and the fluctuating line is the log of chicken-meat consumption

Table 3.3 Additional breaks

Series	Test result	Date	Event
Revenues			
Thirty and younger	18.70 a)	15	Foot-and-mouth disease
Between fifty and sixty-five	28.72 a)	16	Foot-and-mouth disease
Sixty-five and older	21.72 a)	17	Foot-and-mouth disease
Volumes			
Between thirty and forty	14.61 b)	48	End of bird-flu crisis
Between forty and fifty	21.25 a)	22	Foot-and-mouth disease

a) Significant at the 5% level; b) Significant at the 10% level. The critical values of Ben-David and Papell (2000) are given in appendix 7.

While three out of five consumer groups react to the start or end of the bird-flu crisis, only the housewives that are younger than thirty years old cause a revenues-loss for the food industry. Since the bird-flu reaction was not the only break in their consumption pattern, it is of interest to compare the steady-state effects of all the breaks in this series. Table 3.4 gives the steady-state results of each break for this specific consumer group. The substitution effect due to the foot-and-mouth disease crisis in the pig market is a positive level shift of 11.72%. This positive change, however, is complete offset after the introduction of the Euro, where the break has the form of a positive level shift (15.91%) accompanied with a negative break in the trend slope at a rate of -1.61% each period. The third major event is the bird-flu crisis with an immediate loss of 17.20%, however, also with a fast recovery of 1.14% each period, which implies that the revenue loss is transitory.

Table 3.4 The steady-state revenue-effects for housewives of thirty and younger

	Break	change in	
Events	date	level	trend growth
Foot and mouth disease	15	11.72% (6.69)	n.s.
Euro introduction	28	15.91% (7.58)	-1.61% (-6.36)
Bird-flu crisis	44	-17.20% (-7.61)	1.14% (3.56)

The corresponding *t*-values are given in parentheses, and 'n.s.' denotes non-significance.

For the steady-state, only the changes in the trend function are of interest, since, significant slope rates will eventually overtake any level shift. When we examine the changes in the steady-state trending behaviour of the households where the housewife is younger than thirty years old, as displayed in table 3.5, we find that the non-significant pre-event growth rate changed into a loss rate of 1.61% each period after the Euro introduction. Although this loss rate is attenuated after the bird-flu crisis (-1.61%+1.14%), the resulting loss rate (0.47%) is still significant, so we conclude that the introduction of the Euro has caused largest steady-state effect for this consumer group over the considered time span.

In addition to the five consumer groups, we analyse the total market level dynamics, i.e. the sum of the five segments. Following the ADF-test, we find that the revenues are evolving ($p > .10$), while the volumes are stable ($p < 0.05$). Therefore, as aforementioned, we re-analyse the revenues for stationarity, using the unit-root test of Lumsdaine and

Papell (1997), which allows for two breaks. It appears that the revenues are stable ($p < 0.05$) if we allow for a break at t=16 (foot-and-mouth disease) and t=27 (Euro introduction). The multiple-break test of Ben-David and Papell (2000) finds one additional break for total market volumes ($p < 0.05$), which exactly corresponds with the bird-flu crisis (t=42), but no additional break in the revenues series. The fact that the revenues series does not have a bird-flu break, indicates that the volume loss has been offset by an opposite price effect. Figure 3.2 provides a graphical description of the found broke trend slope.

Table 3.5 The steady-state trend growth for housewives of thirty and younger

Events	Trend growth
Before the foot and mouth disease	n.s.
After the foot and mouth disease	n.s.
After the Euro introduction	-1.61% (-6.36)
After the bird-flu crisis	-0.47% (-3.59)

The corresponding *t*-values are given in parentheses, and 'n.s.' denotes non-significance.

In sum, our results indicate that consumer response to the bird-flu crisis is rather heterogeneous, ranging from zero reactions, to level drops, and even trend-slope changes.

3.6 Conclusion

We applied a testing procedure that allows for multiple breaks, and which does not require an a priori imposition of the location of the various break points. The former is needed to avoid omitted-variable biases in quantifying the impact of a given event, while the latter property recognizes that lagged effects may be present, in which case the arrival time of an unforeseen crisis may not coincide exactly with observed changes in the response patterns of consumers.

Through our empirical illustration of this procedure, we also contributed to the empirical knowledge base on the impact of differences in consumer responses to a product crisis. We investigated the over-time impact of the bird-flu crisis on the chicken-meat spending patterns of five consumer groups in the Netherlands. Our main findings are:

- the bird-flu crisis caused a revenue loss of 17.20% among families where the housewife is thirty years old or younger. The break, however, has the form of a transitory level shift implying that the steady-state was not effected by the bird-flu crisis;
- at the total market level, there has been a loss in quantities due to the bird-flu crisis, but this loss is completely offset by an opposite price effect, so there were no revenue losses due to the bird-flu crisis. This finding also implies that the losses among the households where the housewife is thirty or younger are neutralized by the elder generations;
- families where the housewife is younger than forty show a decline in their steady-state trending behaviour due to the Euro introduction;

- the most stable consumption patterns were found among families where the housewife is fifty years or older;
- all series are trend stationary, implying that regular shocks, e.g. caused by temporary price discounts or temporary marketing spending, die out over time;
- the maximum number of structural breaks that were found in a time series was three, and this means that the steady-state dynamics of the chicken-meat consumption market can be explained by a very limited number of unique historic events.

All in all, the five investigated consumer groups show remarkable differences in their responses to the bird-flu crisis and other major events. In the derivation of the steady-state impact of structural breaks, we assumed that no future, not yet anticipated, structural break would take place, so care should be taken when extrapolating our findings too far outside the sample period (see also Deleersnyder et al., 2002).

As indicated before, the Netherlands is not the only country where product-crisis appeared in consumer markets. It is interesting to identify the most probing impacts in other countries as well, which would allow one to derive empirical generalisations, and to identify various underlying drivers for the presence/absence of an impact. In this study, the market segmentations were based on the age of the housewife. It would be very interesting to classify market segments on the basis of the measures of focal interest, e.g. the presence or absence of a response pattern, the magnitude of the initial response, the length of the transition period, the response rate, etc. Such classifications are of direct use for regulators and marketing managers for the determination of the effectiveness of their strategic decision making. For decision makers it is extremely important to work with consistent information, therefore, another topic for future research would be to develop unit-root tests under restrictions, e.g. the restriction that the aggregation over the identified breaks in the various market segments should be equal to the size of the breaks that are found at the total market level.

4. General conclusions and recommendations

In this research report, we presented two showcases. The first adopted an approach based on controlled experimentation, and the second in the field of actual-crisis impact measuring. The lab experimental approach focused on the role of feeling towards and experience with an issue, rather than logic reasoning when considering reported risks and benefits. The actual-crisis impact measuring was assessed on the consumption behaviour of chicken consumption, as collected by GfK, in the period around a bird-flu crisis (in 2003). Both showcases illustrate how different fields of research can benefit the managerial decision making process of market managers, public-policy makers, and other interested parties.

The main conclusions of the first showcase are:

- the consistent negative correlation between risk and benefit perception implies that other psychological processes rather than logical reasoning alone play a role in consumer perception of risk and benefit;
- although some evidence is found that this may be a feeling towards the issue at hand, the results are inconclusive;
- general experience with the issue in hand (measured by habit, age, and illness history) shows that experience plays an important underlying psychological mechanism then feeling;
- when prior knowledge is present, ad-hoc risk or benefit information has less influence on risk or benefit perception; when no prior experience is available, an ad-hoc attitude is constructed from whatever information is obtained first.

The main conclusions of the second showcase are:

- the bird-flu crisis caused a revenue loss of 17.20% among families where the housewife is thirty years old or younger. The break, however, is transitory, implying that the long-run was not effected by the bird-flu crisis;
- at the total market level, there has been a loss in quantities due to the bird-flu crisis, but this loss is completely offset by an opposite price effect, so there were no revenue losses due to the bird-flu crisis. This finding also implies that the losses among the households where the housewife is thirty or younger are neutralised by the elder generations;
- families where the housewife is younger than forty show a decline in their steady-state trending behaviour due to the Euro introduction;
- the most stable consumption patterns were found among families where the housewife is fifty years or older.

The combined conclusions of both showcases suggest that risk benefit judgments as well as purchase behaviour become less easily influenced by external information when a certain age is reached.

Our recommendations are threefold. With respect to showcase 1, whenever data is inconsistent with theoretical frameworks, this method is very well suited to investigate where the theoretical framework is lacking, and how the theoretical framework should be adjusted; the specific showcase illustrates that risk and benefit perceptions are not provided by the '*rational'* consumer but are coloured by personal experience. Practically, these conclusions are important when developing and interpreting risk benefit perception measures for use in e.g. surveys, and how to interpret this kind of data. Furthermore these conclusions underline the importance to take account of personal experience and feelings of consumers instead of rationalistic arguments alone when reporting on possible effects on risk and benefit information.

With respect to showcase two, we recommend to continue this type of research at a lower aggregation level. In this report, we have shown that age matters, i.e. the examined five consumer groups, which differ in the average age of the housewife, show different response patterns to a food-safety crisis. At a more detailed household level, we can measure consumer characteristics with more behavioural detail, e.g. number of children, personality traits, or body mass index. Such characteristics may even further help to explain differences in consumer response, and it helps to identify groups in society that may need special attention from public policy makers, and other interested parties.

To combine the three research approaches in this report (as given in table 1.1), we recommend adopting an interdisciplinary approach, where researchers who are highly-skilled in a method, conduct their research using that method when applicable and cooperate where this strengthens the project (cf. Fischer et al., 2005, pages 512-514). It is in the setting of the overall project objective, and in communicating information from one type of approach to another that the largest gains in interactivity are to be achieved. Our experience is that it is time consuming trying to combine personal expertise on different approaches into a single study that covers the whole topic of interest. Even more important, we believe that such an approach reduces the total quality of the research. Instead, we advocate that the associated researchers agree upon the research aims in rather general terms; and which parts of the program are most suited for which approach. Each partial project can then be conducted by specialised researchers who can produce its own work at the highest scientific standards possible. This way scientific standards of the whole group can be raised (e.g. by publishing results in critically acclaimed international journals). To solve the problem that underlies the research project as a whole, the inferences of each study, can subsequently combined into an overall research report. In this way, there is no loss of specific research quality or expertise, and the research as a whole, answers the questions of the interested parties and stakeholders at the highest possible level of applicability and scientific quality. It has been an additional aim of this report to give an illustration of this strategy.

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Appendix 1. Study 1 Questions and stimuli

Risk Benefit perceptions
Answers on a 5 points scale labelled completely 'disagree'; 'disagree'; 'neutral'; 'agree'; 'completely agree'.

1. There are certain benefits in the consumption of chicken meat.
2. There are certain risks in the consumption of chicken meat.
3. There are benefits to me as consumer to be able to purchase meat in shops that is guaranteed to be free of bacteria.
4. There are risks to me as consumer to be able to purchase meat in shops that is guaranteed to be free of bacteria.
5. There are benefits to myself associated with the domestic preparation of raw meats.
6. There are risks to myself associated with the domestic preparation of raw meats.
7. There are benefits to me as a consumer if bacteria in raw meat are extinguished using modern technology.
8. There are risks to me as a consumer if bacteria in raw meat are extinguished using modern technology.

Stimuli: Affect condition
Answers on a 5 points scale labelled 'very negative'; 'negative'; 'neither negative nor positive'; 'positive'; 'very positive'.

1. The feeling I get when thinking about consuming underdone chicken meat or pork.
2. The feeling I get when imagining regular consumption of cream pies.
3. The feeling I get when thinking about discount offered at the exact sell-by date.
4. The feeling I get with reports of food poisoning.
5. The feeling I get when I think about animal treatment in slaughterhouses.
6. The feeling I get when I think about a filthy kitchen.
7. The feeling about my own health I get when I learn about food crises, like avian flu, and BSE.
8. The feeling I get when thinking about foodborne bacteria like Salmonella.
9. The feeling I get when I see myself eating chips with mayonnaise every week.
10. The feeling I get when I think about organically (Eco) grown vegetables.

Stimuli: Cognition condition
Answers on a 5 points scale labelled 'completely untrue; 'untrue'; 'neither true nor untrue'; 'true'; 'completely true'.

1. When I think about it carefully I think that food poisoning is a threat to public health.
2. Considering all arguments I think the regular consumption of cream pie is not a threat to my health.
3. When thinking about it carefully I think consumption of underdone chicken meat or pork causes problems.

4. Considering all argument, organically (Eco) grown vegetables are better suited for human consumption that other vegetables.
5. When thinking about it carefully, I think it is very important to keep a kitchen clean.
6. When thinking about it carefully I think weakly consumption of chips with mayonnaise is bad for my health.
7. Considering it carefully I think recent food crises, such as avian flu and BSE did not cause any hazard for my health.
8. Considering all arguments, I think the current method of meat production in slaughterhouses is a sensible way to produce food.
9. When I think about it carefully, I think it is a good idea to purchase food that are on discount on their sell-by-date.
10. When I think about it carefully, I think that foodborne bacteria such as Salmonella are no problem.

Appendix 2. Study 2 Stimuli

For the aim of the study's 2a and 2b, we added two additional pairs of risk-benefit judgements, to those in study 1. Furthermore participants were asked to rate all six risks and benefits on a 7-point rather than a 5-point scale. The scale was anchored at 'totally disagree' and 'totally agree'.

1. There are certain benefits in the consumption of meat purchased near the sell-by-date.
2. There are certain risks in the consumption of meat purchased near the sell-by-date.
3. There are certain benefits in the consumption of fish.
4. There are certain risks in the consumption of fish.

Study 2a Scrambled sentence manipulation

Participants were asked to compile 4 word sentences out of the 24 sets of 5 words listed below; 16 of which contain manipulation words. The manipulation word is in bold italic. Note: The original Dutch version always contained 5 words, for translation to English it was sometimes necessary to replace a single word with a two word phrase; this was done for consistent translation only.

Calculation, deliberation (Cognition condition)

1. consumer, sometimes, act, it, ***calculative***
2. ***accounting system***, he, the, noise, disliked
3. product, useful, the, is, playful
4. help, your, health, vitamins, number
5. all, him, ***weighed***, alternatives, Bob
6. book, the, new, purchase, backside
7. office, ***economist***, rich, the, is
8. ball, computer games, the, playing, new
9. ***calculative*** , very, walking, are, cats
10. scientist, ***theories***, their, paper, ***investigate***
11. itself, hides, the, animal, cow
12. ***deliberations,*** his , finalised, hij, source
13. clouds, ***alternatives***, all, review, city folks
14. the, seamless, red, is colouring , sky
15. physician, the, in, ***systematic***, was
16. ***final calculations***, appeared, often, the, yesterday
17. ant, are, animals, with, ***precise***
18. it, I, will, send, mail
19. money, expenditure, ***deliberate***, carefully, your
20. ***cash check***, it, is, the, conducted
21. field, ***calculating***, criminals, are, frightening

22. ***rationally***, choices, professionals, decide, often
23. design, chairs, park, the, buying
24. boss, is, ***precise***, office, my

Intuition, affect prime (affect condition)

1. consumer, sometimes, act, it, ***intuitively***
2. ***harmonised***, they, perfectly, noise, are
3. product, useful, the, is, playful
4. help, your, health, vitamins, number
5. to, June, learn to, ***estimate***, children
6. book, the, new, purchase, backside
7. office, ***spiritual***, healer, the, is
8. ball, computer games, the, playing, new
9. ***playful***, very, walking, are, cats
10. the, ***comprehensive***, was, paper, manuscript
11. itself, hides, the, animal, cow
12. ***dreaming off,*** terraces , sunny, at, clouds
13. source, ***holistic***, everything, review, tribesmen
14. the, seamless, red, is colouring , sky
15. patient, the, in, ***emotional***, was
16. products, create, of, ***integrated***, top-designers
17. horses, are, animals, with, ***sensitive***
18. it, I, will, send, mail
19. ***nice***, is, the, similar, house
20. play, it, by, gamblers, ***feeling***
21. field, ***emotional***, criminals, are, frightening
22. ***intuitively***, choices, professionals, decide, often
23. design, chairs, park, the, buying
24. mother, is, ***sensitive***, office, my

Appendix 3. Study 3 Scales

Participants were asked to indicate to answer the following statement on a 7 point scale from -3 to +3 anchored at completely disagree to completely agree. For prior attitude only an 8th option 'I don't know' was added. The X in the statements was replaced by the products: apple, carambola, salmon, fugu.

Prior/Posterior Attitude
I think eating a X is good for me
I think eating a X is a nice thing to do
I think eating a X is a sensible thing to do
Knowledge and Experience items

I have eaten X several times before
I intend to eat X in the future
I had prior knowledge of properties of X
Risk and Benefit perception
I think X has risks
I think X has benefits

Appendix 4. Perception Split

Table A4.1 Specific values of the effect of information on risk and benefit perception split for information use or not.

Prior attitude	Info Request	Predictor	Risk Perception			Benefit Perception		
			n	β	*p*	*n*	β	*p*
Apple	Yes	Prior attitude	47	-0.19	0.21	32	0.20	0.28
		Context		-0.14	0.35		-0.00	0.99
	No	Prior attitude	58	-0.24	0.86	73	0.43	<.001
		Context		0.13	0.32		0.19	0.09
Carambola	Yes	Prior attitude	68	-0.13	0.31	51	0.12	0.40
		Context		-0.24	0.05		0.15	0.30
	No	Prior attitude	37	0.05	0.79	54	0.27	0.03
		Context		-0.02	0.92		0.32	0.01
Salmon	Yes	Prior attitude	51	-0.14	0.34	35	0.61	<0.01
		Context		-0.12	0.40		0.18	0.18
	No	Prior attitude	54	-0.22	0.12	70	0.77	<0.01
		Context		0.18	0.18		0.01	0.95
Fugu	Yes	Prior attitude	68	-0.02	0.90	53	0.04	0.76
		Context		-0.17	0.17		0.34	0.02
	No	Prior attitude	37	-0.05	0.76	52	0.14	0.33
		Context		-0.10	0.59		0.10	0.50

Appendix 5. Consumer reactions to food scares (illustrative examples)

Kristina Jansson

Beardsworth and Keil (1996) document that after media coverage of food-scare information, consumers may follow a reaction pattern that consists of five steps i.e. (i) initial equilibrium, where the consumers are not so concerned about the potential risk, (ii) news about a new potential risk, (iii) public concerns increase together with an increased media coverage, (iv) public response, usually with avoidance of the suspected food (so, a drop in volume), and (v) attention switches away and a new equilibrium is reached. In the new equilibrium, not only preferences may have changed, but also a chronic anxiety may have appeared among the consumers (Beardsworth and Keil, 1996 after Mazzocchi, 2006). Several factors may influence the size and sign of the consumers' reaction patterns in each of these steps, e.g. type of media message, type of incident, and cultural differences. Below we give illustrative examples of these potential important factors. In doing so, we provide background information that is relevant for the context of the two showcases in this report.

Effect of media

Nowadays, there is a global media-coverage of food-risk incidents, and consumers can acquire information from all continents about the safety of their food products. As a consequence, it may be difficult to pinpoint the exact transition from the initial equilibrium to the second phase, in which the news of the potential risk reaches the public. In fact, it may be questionable whether consumers can be in a phase with no news about potential risks. It is of interest to analyse if the size of the consumer reaction towards a food-safety risk can be explained by the type of media message. For instance, five years before the domestic BSE outbreak in Japan (in 2001), Japanese meat consumption was decreasing. This decrease coincided with UK-media messages about the link between Creutzfeldt-Jacob disease. After every new reported case of Creutzfeldt-Jacob disease, Japanese meat consumption showed a decline. But when a BSE-case finally caused a Japanese victim, the decline in consumption was larger. This illustrates that the effect of media coverage of incidents on consumption may depend on the location of the incident. The fall in consumption was structural and the beef prices have dropped significantly, i.e. up to 55% (Hyun and Koo, 2003). In addition, the effect on the domestic producers was twofold, i.e. (i) the Japanese consumers had lost confident in their products, and (ii) several international trading partners put bans on Japanese beef.

Type of incident

The outbreak of the avian influenza also had an impact on the beef consumption in Japan. Previously the BSE alarms had caused an increase of chicken consumption, but at the outbreak of avian influenza the Japanese consumers did not increase their beef consumption but chose other substitutes: pork and fish. These changes are however not

permanent (Ishida et al. 2006). The Japanese consumer-response patterns show that some incidents may cause a permanent shift, whereas others only created transitory changes. For public policy makers and market decision-makers it is of interest to know what situation is the most likely to appear.

Cultural differences

The cases of food safety risks that have occurred in USA has been isolated and had little effect on the food market, whereas such cases in the EU have had dramatic effects. The import bans that were imposed against American beef after the BSE cases in 2003, caused an over supply in the domestic market, which in turn made the prices drop. At the same time the import bans led to increases in prices in the countries having imposed them (Korea, Japan and Mexico). The price effects of the BSE in the U.S were limited. A number of events (low supply because of production cycles and BSE outbreak in Canada) had caused the prices to reach an all-time high during 2003. The outbreak in December 2003 caused a price decrease on beef, but the prices in January 2004 were still higher than the prices the year before. (USDA, 2006). In Europe, the BSE crisis started in 1996. A huge decrease in consumption occurred as the UK government informed the general public about a possible link between BSE and the Creutzfeldt-Jacob disease. The domestic sales of beef dropped with 40% and household consumption fell with 26% compared to the year before (USDA, 2001). Due to strong concentration in British retail the fall at farm level was double in size compared with the fall in the retail sector. This led to an increase in the margin between producer and retailer (Lloyd et al., 2006). In Germany, where 29 cases of BSE occurred between 2000 and 2001, the consumption fell with 75% in the same period (USDA, 2001). One explanation for the differences in reaction patterns between US and Europe could be that American consumers have greater trust in the food supervision of the country, than do European consumers (USDA, 2004).

Appendix 6. Effects of the Avian influenza outbreak

Kristina Jansson

The Avian Influenza (AI) outbreak has changed the international trade with poultry. Exporters who had outbreaks lost market shares and this was accompanied with sudden price increases (hikes). The AI has disrupted supply and caused many farmers to leave their businesses. A long term effect will be that the competitiveness of countries have changed; earlier the main competitive factor was price, now it is important also to be free of the virus. Outbreak free countries will continue to have an advantage (Chang, 2005). In the EU, the intense media coverage caused a drop with up to 50% in some member states, which lead to an over supply in the EU that was aggravated through import bans that trading partners imposed after the reports of an outbreak (Foreign Agricultural Service, 2006).

In this overview, the aim was to find information on the changes in the market during the AI outbreak in the Netherlands in 2003. In addition four Dutch poultry experts were interviewed to achieve a better understanding on what happened during the outbreak in the Netherlands.

The effects of Avian Influenza in the Netherlands

In the Netherlands the consumer price index (CPI) for poultry shows an increase between 2000 (=100) and 2001 (=109,8). After 2001 the CPI stayed around 110 until 2004 when a decrease of CPI started (CBS, 2006). The chicken meat consumption per capita has increased for a long period; in 1980 it was 8.9 kg and at its highest in 2002 it was 22.5 kg. The consumption dropped with one kilogram per capita between 2002 and 2003 (this is carcasses weight, which means that the actual consumption dropped with about half a kilo. The production of table poultry decreased from 949000 tonnes in 2002 to 720100 tonnes in 2003. The producer prices for table poultry did not change during 2002-2004, it was around 70 cent per kilogram live weight for the whole period (CBS, 2005).

In the Netherlands the outbreak of AI in 2003 has changed the industry in two ways; several farms closed and some change their production from broiler or breeding to laying hens. It was mostly mixed farms that closed. The conversion to laying hens was stimulated by high egg prices at the time. In 2004 the egg prices dropped because of a general over production in the EU and the loss of export markets that the outbreak caused for Dutch producers (Van der Sluis, 2005).

The AI outbreak in 2003 had an enormous influence on the poultry meat market. Because of culling the production fell sharply (turkey -58%, broilers - 15% and poultry - 34%). There was a strong effect on the exports of Dutch poultry; exports to the EU fell with 15 % and the fall in exports to third countries were even stronger at minus 40%. Because of the strong fall in supply the 4% fall of consumption had a limited price effect (also caused by high EU production and imports from Brazil and Thailand). Even though

the overall price effects were small, they had dramatic influence for individual farmers/exporters. The reason for the fall in consumption was high media attention, and there were no substitute effects. The market for broiler meat recovered partly, but to reach the pre-outbreak levels seems impossible.[1]

The drop in demand in 2003 was not particularly strong and recovered easily. In comparison the pig plague outbreak in 1997 had a much stronger effect on consumption. The consumers responding to that outbreak can be divided in two subgroups; one group was for the first time confronted with large scale animal production and they turned to vegetarian or organic consumption, the other group stopped eating meat as a protest against the industry. The effects on the export have turned out to be more persistent than the effects on the domestic consumption and it has turned out to be very difficult to regain market share. This has to be seen in the context of the changes that were already going on in the export business. Already before the outbreak the competitive pressure from Thailand and Brazil was high, as the outbreak came, these two countries took over in some Dutch export markets where Dutch produce was banned. A slow increase in slaughterhouse production was planned to regain the market share, and then came another outbreak this time in southern Europe, which caused the demand to drop once again. With full freeze houses the AI outbreak in 2006 made matters worse with new export bans. Because of the drop in supply there were no strong price effects. As for different reactions among different consumers the elderly tend to be more conservative than the younger (under 50) and when the younger turn to vegetarian food the elderly substitute the meat with fish. Substitution effects were at hand: during pig plague the consumers chose chicken and beef, during FMD they chose chicken and pork and during AI they chose beef and pork. Some also turned to other source for protein (fish and tofu) or to a vegetarian diet. The long term effect is that the total meat consumption is decreasing for each of these outbreaks, meaning that a new equilibrium is reached after each crisis.[2]

Domestic consumption fell a bit, but not as strong as one would have expected today. At the time the effects on humans were not an issue since it was another type of the virus that caused the outbreak in 2003. The strongest effects were seen on the export market since exports were banned. The market recovered, even though the exports are still lower than before.[3]

In general the consumption and prices fell during the outbreak (consumption before prices). The egg prices were not affected as strong as the chicken meat market. Products closer to the production saw stronger consumption drops than did the products further away; convenience food fell less than the fresh products. The market recovered, and this is what normally happens when media attention goes away. A long term effect is that the market has become more instable and there are stronger effects of reports from the food industry than it was before. The consumption seem to recover all the time.[4]

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[1] Hol, R., (2006). Export and Marketing department of PVE. Personal communication on 26th and 27th of September, 2006.
[2] Tacken, G., (2006). Responsible for market research, Animal Department LEI. Coordinator during the AI crisis in 2003, personal communication on 4th of October, 2006.
[3] Onderdijk, M., (2006). Secretary General, NEPLUVI. Personal communication on 3rd of October, 2006.
[4] Mulder, N., (2006). Poultry Expert, Food and Agri Business Division. Rabobank, Personal communication 4th of October, 2006.

Conclusion

The effects during the AI outbreak in The Netherlands are somewhat diverse: the changes in the consumption seem to have been limited both in time and in magnitude, but the effects on the production have been strong and persistent. The outbreak has changed the structure of Dutch poultry production; there are fewer broiler producers and the number of chickens produced has also decreased. Some producers changed their production to eggs because of the high prices of eggs during and after the outbreak. Since then the egg prices have dropped. It is however not clear if these structural changes would have happened anyway but at a slower pace had it not been an outbreak.

The AI outbreak had a huge effect on the exports of poultry. Some markets were lost to other exporting countries and it has been difficult to regain the markets. The changes in the export markets might also have taken place without the outbreak since the competitive pressure from other exporters has been increasing over a longer period.

There is one question that remains unanswered regarding the AI outbreak of 2003. The decreased demand for Dutch poultry did not affect the producer prices in a strong way. Even though the culling caused a reduction in supply, one could have expected some sort of price effect. So, did the drop in supply cover the drop in demand?

Appendix 7. Critical values

Table A7.1 Critical values of of Ben-David and Papell (2000)

Breaks under the Null	Breaks under the Alternative	5 %	10 %
0	1	17.85	15.34
1	2	16.49	14.15
2	3	15.59	13.76
3	4	15.16	13.27
4	5	14.53	12.72