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Trust as a Determinant of Consumer Behaviour under Uncertainty

An Empirical Analysis of Consumers' Reactions to a Random External Shock in Europe

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An Empirical Analysis of Consumers' Reactions to a Random External Shock in Europe

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Kiel, November 2005 Leef H. Dierks

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List of Abbreviations

2SLS	Two-Stage Least Squares Estimation
3SLS	Three-Stage Least Squares Estimation
ANOVA	Analysis of Variance
BSE	Bovine Spongiforme Encephalopathy
CCC	Cubic Clustering Criterion
CUMUL	Cumulative Percentage
EFSA	European Food Safety Agency
EU	European Union
ESS	Error Sum of Squares
GLS	Generalised Least Squares
ITP	Consumers' Intention to Conduct a Particular Behaviour
KMO	Kaiser-Meyer-Olkin
MANOVA	Multivariate Analysis of Variance
MDA	Multiple Discriminant Analysis
MSA	Measure of Sampling Adequacy
MRS	Marginal Rate of Substitution
OLS	Ordinary Least Squares
PCB	Polychlorinated Biphenyl
SEU	Subjective Expected Utility
SOR	Stimulus, Organism, and Response
SUR	Seemingly Unrelated Regression
SP	Subjective Probability
SPARTA	Acronym of subjective norm, perceived behavioural control, attitude, risk, trust, and alia
TACT	Acronym of target, action, context, and time
ZMP	Zentrale Markt- und Preisberichtstelle für Erzeugnisse der Land-, Forst- und Ernährungswirtschaft

List of Notation

Frequently used concepts have a common notation throughout this publication; hence, in this list, the notation is given for the first chapter in which it occurs.

Chapter 2

$\Re_+^n$	commodity space
X	consumption set
$\succ \sim$	the relation “at least as good as”
$u(x)$	utility function
x	commodity bundle
y	commodity bundle
Y	income, monetary endowment
$\subset$	proper subset
$\forall$	for all
ε	element of
i	commodity
p_i	price of commodity i
n	quantity
t	variable
z	commodity bundle
*	optimal value
$g(y,p)$	Marshallian or uncompensated demand function
$h(u,p)$	Hicksian or compensated demand function
$c(u,p)$	cost function
u	utility level
$v(y,p)$	indirect utility function
θ	scalar
$\wp$	vector
l	simple lottery
L_S	set of simple lotteries
α	operand
c_i	consumption in state i
π_i	probability of occurrence of state i

U_i	utility function
Δ	first difference operator
$E(U)$	expected utility
$E(X)$	expected value

Chapter 3

A_B	Behavioural Attitude
b	strength of belief
e_i	evaluation of attribute i
I_i	importance of element i
V_i	value importance
D_K	magnitude of dissonance
s	state of nature
σ	public signal
$\sigma_i(x)$	signal function
M	consumers' consumption of commodities
μ	average quality
D_i	demand for commodity i
S	supply
E	equilibrium
q_i	quantity of commodity i
G	potential gain
L	potential loss
J	supplier
K	consumer
A	reliable supplier
B	unreliable supplier
$P(G\|A)$	conditional probability of purchasing an unsafe commodity from A
$P(G\|B)$	conditional probability of purchasing an unsafe commodity from B
P_i	subjective probability
U_X^+	utility from a safe unit of commodity X
U_X^-	disutility from an unsafe unit of commodity X
U_Y	utility from substitute Y
v	reliability ratio

P_{PJ}	conditional probability of *J* being of type *A* after having observed that *X* is unsafe
P_{PPJ}	conditional probability of *J* being of type *A* after having consecutively observed that *X* is unsafe and that *X* is safe
D	difference in trust before and after receiving relevant information
R	necessary effort to restore consumers' trust
DD	difference indicating remaining loss in confidence
I	consumers' intention to conduct a particular behaviour
w_i	weighing parameter
b^{sal}	consumers' salient beliefs
SN	subjective norm
b^{norm}	consumers' normative beliefs
m_i	consumers' motivation
B	consumers' behaviour
PBC	perceived behavioural control
p	probability, perceived power
c	control belief
T	trust
PR	perceived risk
β, γ	operands
r	risk factor

Chapter 4

A_L	consumers' socio-economic characteristics
r_{ij}	Pearson's product moment coefficient of correlation
d_{ij}	Euclidean distance
k	number of clusters
C	constant
T_A	consumers' trust in information provided by alternative sources
T_F	consumers' trust in information provided by food chain actors
T_{FA}	consumers' trust in information provided by federal authorities
T_I	consumers' trust in information provided by independent sources
T_M	consumers' trust in information provided by media
T_V	consumers' trust in information provided by vested interests

1 Introduction

1.1 Rationale of Research

In recent years, the European Union has experienced a large number of severe food safety crises which have accentuated the need for an improved understanding of consumer behaviour under uncertainty. These random external shocks often refer to incidences as diverse as the bovine spongiform encephalopathy (BSE), swine fever or avian influenza; occurrences which ceteris paribus cause serious economic losses and sudden and abrupt reactions on the part of consumers. As their behaviour cannot be satisfactorily explained by literature's favoured rationality principle – realistically, consumers do not comply with the assumptions of an alleged homo oeconomicus – other than the well tried solutions might be necessary. Even though most current approaches prove to be responsive to these shortcomings, an adequate and convenient frame of reference for comprehensively elucidating consumers' reactions to random external shocks is not available down to the present day.

Regardless of their general acceptance as prevailing normative models of individual choice, established concepts like neoclassical microeconomic approaches do not provide an utterly adequate description of so complex a field as consumer behaviour under uncertainty. Irrespective of its fundamental significance, the subjective Expected Utility Theory, for example, fails to explain above reactions which evidently are determined by other than exclusively economic patterns. In order to account for these features nonetheless, the traditional analysis of consumer behaviour under uncertainty is complemented by additionally considering behavioural aspects. Among the most relevant characteristics, particularly with regard to intransparent and hazardous situations, is the element of trust.

Despite the wide-spread understanding of the increasing importance of behavioural patterns for a comprehensive analysis of consumer behaviour under uncertainty, their embedding into economics still is in its initial stages. Trust and the conditions under which it might be considered as a factor of influence have so far only been sketchily discussed and applied incompletely to consumer behaviour under uncertainty. Yet, as literature suggests, incorporating the element of trust can commonly be accepted as a rational strategy on the part of consumers to reduce their uncertainty in the context of decision making, most notably involving the purchase of goods which mainly possess credence qualities (Böcker and Hanf, 2000). As this applies to nearly all foods, the significance of trust as a determinant of

consumer behaviour under uncertainty might in future be considered as being equally important to economic factors.

1.2 Objective of Research

The scientific interest in analysing the impact of trust as a determinant of consumer behaviour under uncertainty does not only arise from significantly contributing to a more in-depth understanding of the nature, the determinants and the process of consumer behaviour under uncertainty – but also from complementing economic theories to that effect that consumers' behavioural patterns are understood as influencing consumer behaviour in a manner comparable to classical economic elements such as income and price. Such completions prove to be indispensable for guiding a coherent description of consumer behaviour under uncertainty and for predicting consumers' likely reactions in the environment of random external shocks.

Within the scope of the European Commission's cross national research project *Food Risk Communication and Consumers' Trust in the Food Supply Chain*, this publication basically aims at analysing three major issues. First, emphasis is placed on conceptually ascertaining the significance of trust and its evident complement, perceived risk, as further determinants of consumer behaviour under uncertainty. Since there is little virtue in reconsidering past food safety incidences, the effects of trust and perceived risk on consumer behaviour are analysed both in a quotidian and presumably safe setting and in an intransparent and hazardous situation which is represented through a hypothesised salmonella infestation of poultry. Second, emphasis is placed on empirically assessing the impact of trust and perceived risk on consumer behaviour by means of a pan-European survey designed to determine consumers' country-specific reactions to the very food safety incidence. Similarities inherent in consumers' responses might provide valuable information regarding the influence of underlying behavioural patterns on consumer behaviour under uncertainty and would substantiate the necessity to enhance the classical consumer theory by other than exclusively economic determinants. Third, emphasis is placed on investigating causal relationships between consumers' socio-economic characteristics and the elements of trust and perceived risk. Should formal analyses allude to the existence of different population segments defined by consumers' trust in selected sources of information, the latter might likewise be reliably predicted on the basis of consumers' socio-economic characteristics. Such distinct categorisation of consumers' trust on the basis of socio-economic traits would facilitate the

development of risk communication strategies and might in consequence reduce economic losses attributed to non-selective communication strategies.

The methodological framework underlying this research project principally refers to Ajzen's widely recognised Theory of Planned Behaviour (1985) which aims at defining consumers' intentions to conduct a particular behaviour by means of a trichotomy of independent beliefs. Given that these variables predominantly represent cognisant and volitional antecedents of consumer behaviour under uncertainty, an extensive enhancement equally featuring as well trust as perceived risk, and – in a later stage – consumers' socio-economic characteristics appears reasonable. Based on a multilevel adaptive model relating to a Bayesian Revision Process, respective steps result in the development of the so-called SPARTA model which allows for estimating the impact of the aforementioned determinants on consumer behaviour under altering circumstances.

In spite of its evident restriction to the analysis of a hypothetical food safety incidence, this modus operandi will evince to what extent the explanatory power of traditional economic theories might benefit from similarly considering economic and behavioural parameters. Complemented by expedient statistical analyses, the approach will clarify the motives behind consumers' reactions to random external shocks. Lessons learnt from this recent field of research are expected to provide a valuable insight into consumer behaviour in the environment of a food safety incidence and to provide as well fundamental background information for future studies of consumers' reactions to comparable incidences as a sound basis for generalising the analysis to other, less special occurrences. In conclusion, this might positively contribute to the development of appropriate and sustainable measures designed to more effectively disclose food risks and to thus safeguard consumers' trust as a crucial determinant of consumer behaviour under uncertainty.

1.3 Outline

In order to provide satisfactory answers to the issues raised above, the analysis of trust as a determinant of consumer behaviour under uncertainty is structured in six chapters as illustrated in figure 1.1.

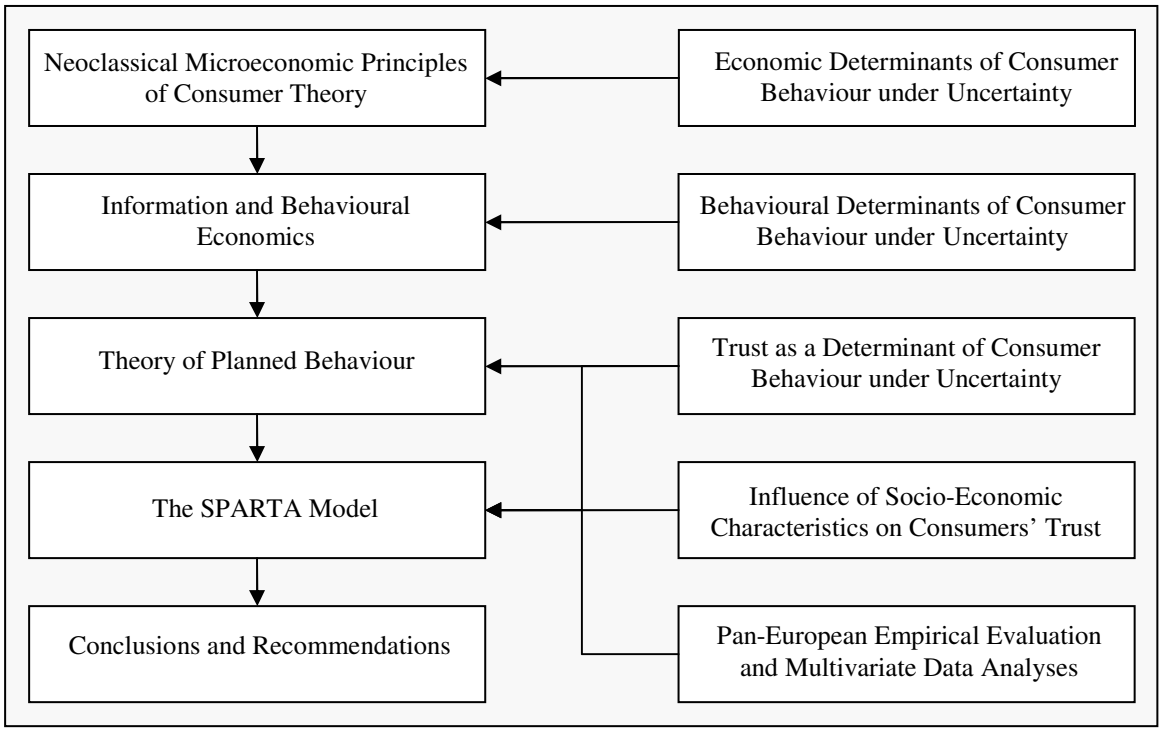

Figure 1.1 Structure of the Research Project

Following the second chapter's outline of the principles of consumer theory, chapter three completes the neoclassical microeconomic approaches through approaches from behavioural and information economics. Moreover, this chapter introduces the element of trust into Ajzen's (1985) Theory of Planned Behaviour whose enhancements provide a sound theoretical basis for investigating the effect of other than economic determinants on consumers' reactions. Descriptive findings from a pan-European survey and empirical methods employed to analyse the impact of consumers' trust on their behaviour are illustrated in chapter four. Moreover, this chapter also presents pan-European estimates for the motives effecting consumer behaviour as well in a standard situation as in the environment of a food safety incidence. With a focus on solely German consumers, these issues are reconsidered in chapter five, especially with regard to the question whether trust can be reliably assessed on the basis of socio-economic characteristics. Furthermore, chapter five expounds the problems of drawing an unambiguous conclusion based on the results of the empirical analyses. The study closes with a summary in chapter six.

2 Principles of Consumer Theory

The term consumer behaviour is often used with different meanings. The definition underlying this analysis refers to an individual's behaviour when purchasing and consuming goods, i.e. 'activities agents undertake when obtaining, consuming, and disposing of products' (Engel et al., 1993, p. 27). The consumption of goods per se satisfies the individual's demand which is determined by its needs and desires.

The traditional economic demand analysis, usually equated with the neoclassic demand theory, derives the individual's behaviour from the assumption of maximising utility subject to certain constraints. *Utility* is generally defined as the satisfaction of wants and needs achieved through the consumption of goods and services (Neumann and Morgenstern, 1944, p. 17).

Formally, the traditional economic demand analysis occurs within the framework of scientific models. These can be understood as an analytic, mainly formalised system of theories or hypothesis and are regarded as a necessity to allegorise the complexity of real systems in a simplified, abstract mode (Varian, 1999, p. 2). The need of an analytic reduction and abstraction follows from the impossibility to display the real multitude in a complete and exact manner (Hardes and Schmitz, 2000, p. 14).

The subsequent subchapter will briefly outline the classical demand theory, predominantly featuring the principles of the neoclassical demand analysis such as the homo oeconomicus and his concept of maximising utility, and the indispensable axioms; whereas the second subchapter focuses on behaviour under uncertainty. It highlights the expected utility theorem and the approach's theoretical options and limits. The chapter will conclude with a compendious summary.

2.1 Classical Demand Theory

The following subchapter will provide a brief insight into the neoclassical demand theory which describes the behaviour of an average or representative consumer.

Within a traditional approach to the theory of consumer demand, the analysis of consumer behaviour begins by specifying the individual's exogenously determined preferences over the commodity bundles in the *consumption set*. The consumption set is a subset of the commodity space $\Re^n$ and contains *all* consumption bundles that the individual can conceivably consume taking into account his monetary and non-monetary restrictions, $X = \Re^n_+$ (Mas-Colell et al.,

1995, p. 18 and 41). The consumer is assumed to act on a *market* with *perfect competition* which is characterised through the following conditions

- homogeneity of goods,
- lack of spatial, personal or chronological preferences,
- absolute market transparency, and an
- infinitely fast reaction of the market participants.

In reality, however, commodities are not perfectly homogeneous and thereby cause spatial, personal or chronological preferences in supply and demand. Suppliers and consumers have asymmetrical information regarding the market occurrences and price which violates both the transparency condition and the law of the indiscrimination of prices (Mankiw, 1998, p. 71). Thus, most markets do not conform to one or more of the above conditions and may therefore be understood as an *incomplete market* (Akerlof, 1970, p. 490).

As the individual has a well defined set of preferences, bundles of less preferred commodities can be differentiated from more preferred bundles (Deaton and Muellbauer, 1999, p. 26). For formal reasons this preference relation defined $\succ\sim$ on $\Re_+^n$ is continuous and hence representable by a continuous *utility function* $u(x)$. A utility function $u(x)$ assigns a numerical value to each element in *X*, ranking the elements of *X* in accordance with the individual's preferences. More precisely,

$$x \succ\sim y \quad \Leftrightarrow \quad u(x) \geq u(y).$$

Note that a utility function that represents a preference relation $\succ\sim$ is not *unique*. For any strictly increasing function $f : \Re \to \Re$, $v(x) = f(u(x))$ is a new utility function representing the same preferences as $u(\cdot)$ with only the ranking of alternatives being relevant. The properties of utility functions that are invariant for any strictly increasing transformation are *ordinal. Properties* of utility functions that are not preserved under such transformations are referred to as *cardinal*.

Cardinal utility is a notion of utility measurement based on the presumption that utility is a quantifiable characteristic of human activity. It can be measured with comparable numerical values (one, two, three, etc.) based on a benchmark scale. This allows an evaluation against an

objective standard and facilitates the comparison of utility between goods. The numerical values associated with the alternatives in *X*, hence the magnitude of any differences in the utility measure between alternatives, are cardinal properties. However, a cardinal measurement of utility has so far not been achieved since utility is not measurable in natural units.

Ordinal utility, in contrast, presumes that utility is not a quantifiable characteristic and that preferences are subjective. Preferences among goods can be ranked (first, second, third, etc.) but not measured according to a scale. In this regard, consumers only need to specify whether a good is more or less preferred than another. To what extent a good is preferred is not important (Mas-Colell et al., 1995, p. 43). The preference relation associated with a utility function is an ordinal property.

Exogenous circumstances limit the consumer's attainable alternatives to the set $X \subset \Re_+^n$ out of which the consumer will choose the most preferred feasible option according to his preference relation (Jehle and Reny, 2001, p. 18)

$$x^* \in X \text{ such that } x^* \succ\sim x \text{ for all } x \in X . \qquad (2.1)$$

In the basic problem of preference maximisation, the set of affordable alternatives corresponds to the set of commodity bundles which satisfy the consumer's budget constraint. There is a market for each commodity *i*, and in these markets, a price p_i prevails for each commodity. The vector of prices of the commodities is strictly positive, $p_i > 0, i = 1,...,n$ (Varian, 1992, p. 98).

The consumer is endowed with an exogenously determined amount of money, his income, $y \geq 0$. The savings ratio is assumed to be zero, i.e. the consumer's income *y* equals his expenditures. Since the purchase of x_i units of commodity *i* at price p_i per unit requires an expenditure of $p_i x_i$, the requirement that expenditure does not exceed income can be denoted as $\sum_{i=1}^{n} p_i x_i \leq y$ or, more generally, $p \cdot x \leq y$. This economic-affordability constraint, combined with the condition of $x \in \Re_+^n$, implies that the set of feasible consumption bundles consists of the elements of the set

$$X = \left\{ x \middle| \, x \in \Re_+^n, \;\; p \cdot x \leq y \right\}. \tag{2.2}$$

This set is known as the *Walrasian* or *competitive budget set* (Mas-Colell et al., 1995, p. 21).[1] The considered commodities $x = (x_1, x_2, ..., x_n)$ available on a market in any quantity *n* are assumed to be *homogeneous*. With respect to the market structure, the individual consumer is an insignificant force on the market. He does not have a perceptible effect on prices p_i, which thus are considered to be *fixed* (Jehle and Reny, 2001, p. 20). Still, prices represent the only information the consumer needs to choose a commodity bundle which maximises his utility, taking into account his budget constraint. Since the consumer is assumed to be a *rational decision maker*, his preference relation necessarily needs to satisfy the following standard properties (Varian, 1992, p. 95).

- Completeness – *for all* x *and* y *in X, either* $x \geq y$ *or* $y \geq x$ *or both.*
- Reflexivity – *for all* x *in X,* $x \geq x$.
- Transitivity – *for all* x, y *and* z *in X, if* $x \geq y$ *and* $y \geq z$, *then* $x \geq z$.
- Continuity – *for all y in X, the sets* $\{x : x \succeq y\}$ *and* $\{x : x \preceq y\}$ *are closed sets. It follows that* $\{x : x \succ y\}$ *and* $\{x : x \prec y\}$ *are open sets.*
- Strong Monotonicity – *if* $x \geq y$ *and* $x \neq y$, *then* $x \succ y$.
- Strict Convexity – *given* x ≠ y *and* z *in X, if* x ≥ z *and* y ≥ z, *then* $tx + (1-t)y \succ z$ *for all* $0 < t < 1$.

A subset of the axioms considered above is required to guarantee the existence of a continuous utility function representing a preference relation. In the case of the consumer's preference relation being *complete, reflexive, transitive, continuous*, and *strongly monotonic* a continuous utility function $u(x)$ can be derived. Additionally applying *strict convexity* yields a utility function which is strictly quasi concave on $\Re_+^n$ (Phlips, 1983, p. 24). Thus, the consumer's problem of choosing his most preferred commodity bundle in consideration of exogenously determined prices $p > 0$ and his monetary endowment $y \geq 0$ can now be recasted as the following utility maximisation problem (Mas-Colell et al., 1995, p. 50)

[1] The Walrasian budget set is named after the French economist Léon Walras (1834-1910), who set forth the neoclassical economic theory in a formal general equilibrium setting.

$$\max_{x \in \Re_+^n} u(x) \qquad s.t. \quad p \cdot x \leq y \ . \tag{2.3}$$

The consumer chooses a consumption bundle in the Walrasian budget set (2.2) to maximise his utility level. If x^* solves this problem, then $u(x^*) \geq u(x)$ for all $x \in B$, which means that $x^* \succ\sim x$ for all $x \in X$. According to this, solutions to 2.3 are also solutions to 2.1 and vice versa (Jehle and Reny, 2001, p. 20).

The rule that assigns the set of optimal consumption vectors in the *primal optimisation approach* outlined in (2.3) to each price-wealth combination $(p, y) >> 0$ is denoted by $x(p, y) \in \Re_+^n$ and is known as the *Walrasian demand correspondence.* The approach of maximising a strictly quasi concave utility function $u(x)$ with respect to the quantities ensures the integrability of demand equations. When $x(p,y)$ is single-valued for all (p,y), it is referred to as the *uncompensated* or *Marshallian demand function* (Mas-Colell et al., 1995, p. 51). However, not only the maximisation of a utility function $u(x)$ with respect to the quantities ensures the integrability of demand equations but also the *minimisation* of the dual cost function with respect to prices (2.4). This is the *Hicksian* or *compensated correspondence* respectively *demand*, if single-valued

$$\min_{x \geq 0} p \cdot x \qquad s.t. \quad u(x) \geq u \, . \tag{2.4}$$

Whereas the utility maximising approach generates the maximal level of utility that can be obtained given the consumer's financial endowment y, the *expenditure minimisation approach* computes the minimal level of financial endowments required to reach a certain utility level u and thus is the *dual problem* to maximising utility (Mas-Colell et al., 1995, p. 58). The same level of utility u and expenditures y can be used throughout both problems since the utility level u regarded in the dual problem corresponds to the maximum utility level u attainable in the original problem (Deaton and Muellbauer, 1999, p. 37).

Figure 2.1 summarises the concept of duality in consumption theory. Arrows denote possible transitions between the two approaches that in principle are simply alternative ways of communicating the same information (Deaton and Muellbauer, 1999, p. 38).

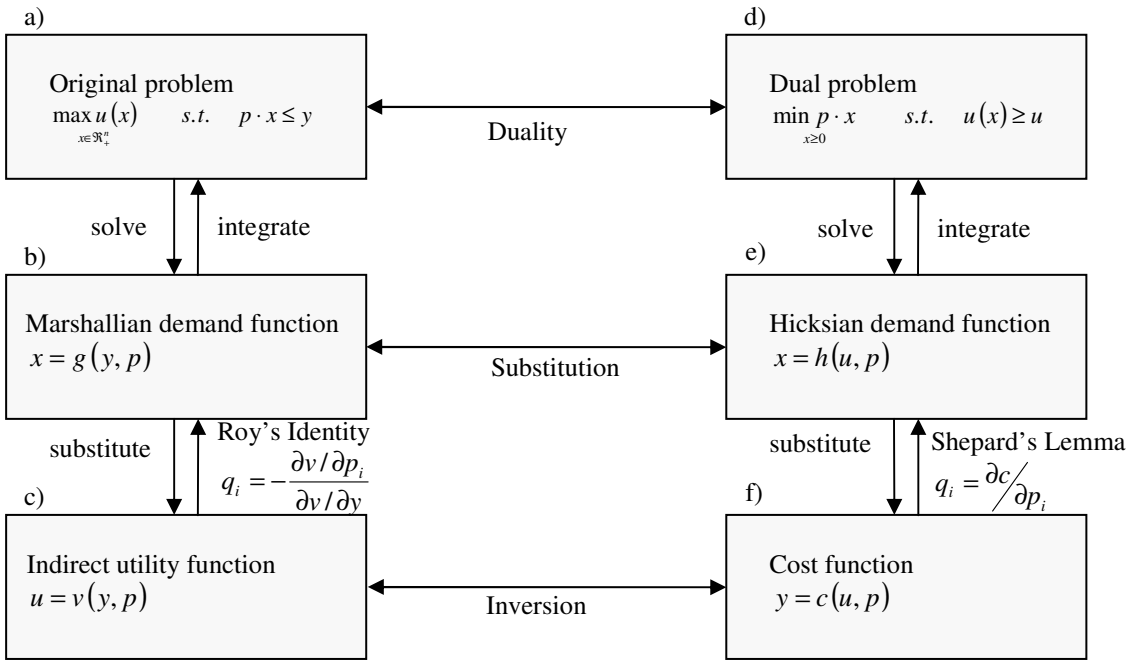

Figure 2.1 Duality in Consumption Theory
Source: Mas-Colell et al., 1995, p. 75.

The solution of the original problem, maximising the direct utility function subject to the consumer's budget constraint (a), yields a set of Marshallian demand functions (b). The substitution of these demand functions into the direct utility function results in an indirect utility function (c), which indicates utility depending on prices *p* and income *y*. Reversing the order and starting from the indirect utility function, Marshallian demand functions can be derived by means of *Roy's Identity*.

Since utility maximisation and cost minimisation must imply the same choice, the expenditures in the original problem must correspond to the cost minimum in the dual problem, i.e. the expenditures for an exogenously predetermined level of utility are to be minimised (d). Correspondingly, the determining variables are *u* and *p* instead of *y* and *p*. The solution is a set of cost-minimising demand functions, known as Hicksian demand functions (e). Implementing a Hicksian demand function into the dual problem yields the minimum cost of attaining the utility level *u* at prices *p* and is generally referred to as the *cost* (or *expenditure*) *function* (f). Applying *Shepard's Lemma* to the derivation of the cost function leads back to the Hicksian demand function, so that the partial derivatives of the cost function with respect to prices *p* yield the Hicksian demand functions, provided that these derivations exist and $p_i > 0 \; \forall \; i$ (Edgerton et al., 1996, p. 57).

The cost function and the indirect utility function are intimately related. Since $c(u, p) = y$, an inversion yields *u* as a function of *y* and *p*, which leads to $u = v(y, p)$. Similarly, the inversion of $u = v(y, p)$ directly leads to $c(u, p) = y$. This also accounts for the Marshallian and Hicksian demand functions which allow for a transition once the cost function respectively indirect utility function is substituted.

To comply with the above, the expenditure function has to satisfy the following properties (Deaton and Muellbauer, 1999, p. 39; Mas-Colell et al., 1995, p. 59). These are

- Homogeneity of degree one in prices *p*, or formally, for a scalar $\theta > 0$ $c(u, \theta p) = \theta c(u, p)$. If prices double, twice as much expenditure is required to stay on the same level of utility.
- Increasing in utility *u*, or formally $u \geq u'$ and $c(u, p) \geq c(u', p)$. This property follows from the nonsatiation axiom. At given prices, the consumer has to spend more to obtain higher levels of utility. Increases in prices require at least as much expenditure to remain on the same level.
- Nondecreasing in prices *p*, and increasing in at least one price p_i for $i = 1,...,n$, or formally $p \geq p'$ respectively $c(u, p) \geq c(u, p')$. An increase in prices requires at least as much expenditure for the consumer to remain on the same level of utility.
- Concave in prices *p*, $c[u, tp + (1 - p')] \geq c(u, p) + (1 - t)c(u, p')$ for $0 \leq t \leq 1$. Concavity in prices implies that as prices rise, costs rise no more than linearly. This is essential since as the consumer minimises costs he rearranges purchases in order to take advantages of changes in the structure of prices.
- Continuity in prices *p*. The first and second derivatives with respect to *p* are of measure zero, i.e. they exist everywhere except possibly at a set of specific price vectors.

According to the utility maximising problem presented above, the consumer can obtain the maximal (optimal) level of utility u^* by consuming the commodity vector $x = (x_1^*,..., x_n^*)$ (Deaton and Muellbauer, 1999, p. 44). Analogously, minimising the expenditures required to reach the utility level u^* yields an identical commodity bundle, so that $x_n^* \equiv h_i(u^*, p) \equiv g_i(x, p)$ with *p* denoting the price vector $p = (p_1,..., p_n)$. Applying the

expenditure function into the identity mentioned before results in $h_i(u^*, p) \equiv g_i[c(u^*, p), p]$. A differentiation with respect to p_i yields

$$\frac{\partial h_i(u^*, p)}{\partial p_j} = \frac{\partial g_i(c(u^*, p), p)}{\partial c(u^*, p)} \cdot \frac{\partial c(u^*, p)}{\partial p_j} + \frac{\partial g_i(c(u^*, p)p)}{\partial p_j}. \tag{2.5}$$

Applying Shepard's Lemma and rearranging yields the *Slutsky equation*

$$s_{ij} = \frac{\partial h_i}{\partial p_j} = \frac{\partial g_i}{\partial x} q_j + \frac{\partial g_i}{\partial p_j}. \tag{2.6}$$

The Slutsky equation indicates the change in Marshallian demand with respect to a (partial) change in prices. The overall effect of a change in prices $\partial x_i/\partial p_j$ can be divided into a *substitution effect* $\partial h_i/\partial p_j$ and an *income effect* $(\partial x_i/\partial y)x_j$. Whilst the substitution effect shows the changes in Hicksian demand, i.e. the demand at a constant utility level, the income effect specifies losses respectively gains to income from a change in prices.

A general characterisation of both Marshallian and Hicksian demand functions leads to four rather basic general properties of demand functions. The latter are additive, homogeneous of degree zero in prices and expenditure, and their compensated price responses are symmetric and form a negative, semi definite matrix. Formally,

- *Adding Up.* The total value of both Marshallian and Hicksian demands equals total expenditure, i.e. the budget constraint is totally exploited

$$\sum p_k h_k(u, p) = \sum p_k g_k(y, p) = y. \tag{2.7}$$

- *Homogeneity*. The Hicksian demands are homogeneous of degree zero in prices, the Marshallian demands in total expenditure and prices together, that is, for scalar $\theta > 0$,

$$h_i(u, \theta p) = h_i(u, p) = g_i(\theta y, \theta p) = g_i(y, p). \tag{2.8}$$

- *Symmetry*. The cross-price derivatives of the Hicksian demands are symmetric,

$$\frac{\partial h_i(u,p)}{\partial p_j} = \frac{\partial h_j(u,p)}{\partial p_i} \quad \forall i \neq j. \tag{2.9}$$

- *Negativity*. Own-price effects are not positive. The *n*-by-*n* matrix formed by the elements $\partial h_i/\partial p_j$ is negative semi definite, i.e., for any *n* vector $\wp$, the quadratic form

$$\sum_i \sum_j \left(\wp_i \wp_j\right) \partial h_i / \partial p_j \leq 0. \tag{2.10}$$

  In case the negativity property is violated, the expenditure function is not concave and thus not dual to a utility function (Deaton and Muellbauer, 1999, p. 44).

The addition and homogeneity are consequences of the specification of a linear budget constraint. Symmetry and negativity are derived from the existence of consistent preferences. Whilst symmetry guarantees the consumer's consistency of choice, negativity results from the concavity of the cost function which is due to the fact that costs are minimised or, equivalently, that utility is maximised.

To recapitulate, consumer behaviour in the neoclassical demand theory can in a simplified context be understood as maximising utility under budget restrictions. The utility function is a convenient device for summarising the information contained in the (representative) rational consumer's preference relation. The demand set, whose integrability is ensured through maximising the utility function with respect to quantities, must be compatible with the consumer's preference relation.

2.2 Behaviour under Uncertainty

According to the framework established in the previous subchapter, economic agents strive for the maximisation of utility in an environment of absolute certainty. This allows them to *ex ante* determine all consequences of their decisions (Deaton and Muellbauer, 1999, p. 86).

In reality, consumers do not operate under such conditions. Economic decisions contain elements of *uncertainty* such that the consumer might not be able to ascertain all possible outcomes of his actions. Under uncertainty, the consequences of any action will vary according to the outcomes of events beyond the control of the individual. These events are usually referred to as *states of nature* or simply *states* (Arrow, 1974, p. 45). Uncertainty is thus characterized as 'an aspect of nature, external to individuals' (Deaton and Muellbauer, 1999, p. 382).

With respect to the prevailing view in economics, the possible differentiation between *uncertainty* and *risk* which is originally attributed to Knight will be disregarded throughout this publication. According to Knight, *risk* refers to situations where an individual is able to calculate probabilities on the basis of an *objective* classification of instances. *Uncertainty*, however, refers to situations where no objective classification is possible (Knight, 1921, p. 226). Yet, both terms will be used interchangeably as it appears irrelevant whether an objective classification is possible or not. Within a *subjective* classification a *probability* simply is the degree of belief, i.e. the individual's subjective probability (Savage, 1954, p. 30; Hirshleifer and Riley, 1992, p. 9). The subjectivity of beliefs does not exclude their being influenced by experience, however (Arrow, 1974, p. 46). The influence of experience on beliefs is important for a rational theory of consumer behaviour under uncertainty as to be discussed in chapter 3.3.3. Despite the existence of experiences regarding the relative frequency of past events, the extrapolation of these experiences into the future and the expectation of probabilities are based on the assumption that experiences in the past will repeat themselves in the future. This assumption, however, cannot be substantiated through experience. The postulation of probabilities for future events thus is *always* an act of expectation (Neumann, 1994, p. 226).

The principal analytical approach to uncertainty is based on the early work of von Neumann and Morgenstern (1944).[2] Despite many critics, von Neumann and Morgenstern popularised

[2] John von Neumann was one of the leading mathematicians in the twentieth century. Oscar Morgenstern was an economist at Princeton, who helped to develop the game theory along with von Neumann (Varian, 1999, p. 219). The earliest application in explaining various behavioural phenomena, however, preceding utility

an approach based upon the *maximisation* of the *expected value of utility*.[3] If the consumer aimed at directly maximising the expected value of *consumption* instead, he would only be interested in the *average* consumption. The element of uncertainty would be excluded from the analysis. Moreover, there is a second, rather formal reason to assume the maximisation of expected utility. Since the expected value of a random variable can be infinitely large, a maximisation is mathematically impossible. The introduction of a utility function, however, assures that the parameters which are to be maximised reach a finite value. Correspondingly, the utility function needs upper barriers which can only be assured through a strictly concave utility function (Neumann, 1994, p. 227).

In the previous subchapter, the consumer was assumed to have a preference relation over *consumption bundles x* in a consumption set *X*. In the case of uncertainty, the consumer is assumed to have a preference relation over *lotteries*, instead. Lotteries are generally referred to as representations of risky alternatives and are describable through objectively known probabilities defined on an abstract set of possible outcomes (Jehle and Reny, 2001, p. 93). A set of *simple lotteries* L_s is defined as $L = (p_1,..., p_N)$ with $p_i \geq 0$ for all *n* and $\sum_n p_i = 1$, where p_i is interpreted as the probability of outcome *n* occurring (Mas-Colell et al., 1995, p.168). The set of simple lotteries L_s assigns the probability p_i to each of the outcomes x_i in the set of outcomes *A*; formally

$$L_s \equiv \left\{ (p_1 \circ x_1,..., p_n \circ x_n) \;\middle|\; p_i \geq 0, \sum_{i=1}^{n} p_i = 1 \right\}. \tag{2.11}$$

If an individual's preferences are represented by a utility function with the expected utility property, and if that person always chooses his most preferred alternative available, then that individual will choose one lottery over another if and only if the expected utility of the one exceeds that of the other. Apparently, such an individual is an expected utility maximiser as

theory by more than a century, is David Bernoulli (1738) to the St. Petersburg paradox (Deaton and Muellbauer, 1999, p. 387).

[3] Regarding the notation of the expected value, it will be assumed that *X* is a random variable in a subset *S* of $\Re$. If *X* has a discrete distribution with a density function *f* then the *expected value* of *X* is defined as $E(X) = \sum_{x \in S} xf(x)$. If *X*, however, has a continuous distribution with density function f then the expected value of X is defined by $E(X) = \int_S xf(x)dx$.

described in subchapter 2.1 and its preference relation can be described through an *expected utility function* (Jehle and Reny, 2001, p. 97).

Analogous to the case of decision making under certainty, it can be assumed that the decision maker has preferences $\succ$ over the set of lotteries, L_s, which need to fulfil the following axioms. These are mostly similar to those discussed in the previous subsection.

- Completeness – *for any two lotteries,* l *and* l' in L_s, either $l \succ\sim l'$, *or* $l' \succ l$.
- Transitivity – *for any three lotteries* l, l', *and* l'' *in* L_s, *if* $l \succ l'$ *and* $l' \succ l''$, *then* $l \succ l''$.
- Continuity – *for any lottery* l *in* L_s, *there is some probability* $\alpha \in [0,1]$ *such that* $l \sim (\alpha \circ x_1, (1-\alpha) \circ x_n)$.
- Monotonicity – *for all probabilities* $\alpha, \beta \in [0,1]$, *if and only if* $\alpha \geq \beta$, *then* $(\alpha \circ x_1, (1-\alpha) \circ x_n) \succ (\beta \circ x_1, (1-\beta) \circ a_n)$.
- Substitution – *if* $l = (p_1 \circ l^1, ..., p_k \circ l^k)$, *and* $h = (p_1 \circ h^1, ..., p_k \circ h^k)$ *are in* L_s, *and if* $h^i \sim g^i$ *for every i, then* $h \sim g$.
- Reduction to simple lotteries – *for any lottery* $l \in L$, *if* $(p_1 \circ a_1, ..., p_n \circ a_n)$ *is a simple lottery induced by l, then* $(p_1 \circ a_1, ..., p_n \circ a_n) \sim l$.

The axioms of substitution and reduction to simple lotteries can be merged into a single, so-called *independence axiom* (Hirshleifer and Riley, 1992, p. 19).[4] It implies that the utility function for contingent consumption is additive across the different contingent consumption bundles.

If c_1, c_2 and c_3 are the consumptions in different states, and π_1, π_2 and π_3 are the probabilities that these states occur, then, if the independence assumption alluded to above is satisfied, the utility function has the form

$$U(c_1, c_2, c_3) = \pi_1 u(c_1) + \pi_2 u(c_2) + \pi_3 u(c_3), \tag{2.12}$$

[4] The independence axiom was first proposed by von Neumann and Morgenstern (1944) as an incidental result in game theory (Mas-Colell et al., 1995, p. 171).

which corresponds to an expected utility function. The expected utility function satisfies the property that the marginal rate of substitution between two goods is independent of the quantity of the third good

$$MRS_{1,2} = \frac{\Delta u(c_1, c_2, c_3)/\Delta c_1}{\Delta u(c_1, c_2, c_3)/\Delta c_2} = \frac{\pi_1 \Delta u(c_1)/\Delta c_1}{\pi_2 \Delta u(c_2)/\Delta c_2}. \tag{2.13}$$

In its completeness, the axioms characterised above allow the derivation of a continuous, real-valued utility function represented by *L*, which is linear in the effective probabilities in the outcomes. More precisely, if $u: L \to \Re_+^n$ is a utility function such that for every simple lottery $L = (p_1, ..., p_N) \in \mathcal{L}$, then $u(l)$ denotes the utility number assigned to the lottery *L*. In particular, the utility function *u* assigns a value $u(a_i)$ to each outcome a_i for all *i*.

The described utility function $u: L \to \Re_+^n$ has an *expected utility form* if there is an assignment of numbers $(u_1, ..., u_N)$ to the N outcomes such that for every simple lottery $L = (p_1, ..., p_N) \in \mathcal{L}$

$$U(L) = u_1 p_1 + ... + u_N p_N. \tag{2.14}$$

Such a utility function $u: L \to \Re_+^n$ with the expected utility form is called a *von Neumann-Morgenstern expected utility function*. If L^n denotes the lottery that yields outcome *n* with probability one, then $u(L^n) = u_n$. In this context, it is indispensable to elucidate the *Expected Utility Theorem*. It states that if the decision maker's preferences over lotteries satisfy both the continuity and independence axioms, then his preferences are representable by a utility function with the expected utility form (Mas-Colell et al., 1995, p. 175).[5] Formally, a value $u(a_i)$ can be assigned to each outcome a_i such that for any two lotteries $L = (p_1, ..., p_N)$ and $L' = (p_1', ..., p_N')$

$$L \geq L' \text{ if and only if } \sum_{n=1}^{N} u_n p_n \geq \sum_{n=1}^{N} u_n p_n'. \tag{2.15}$$

[5] Proof for the Expected Utility Theorem is presented in Arrow (1974, p. 53) and Jehle and Reny (2001, p. 98).

Thus, the term *expected utility* is appropriate since the utility of a lottery can be thought of as the expected value of the utilities u_n of the N outcomes within the von Neumann-Morgenstern expected utility form (Mas-Colell et al., 1995, p. 173). The expression

$$u(L) = \sum_{i=1}^{n} p_i u(a_i) \tag{2.16}$$

is a general form for a *linear function* in the probabilities $(p_1,..., p_N)$. The von Neumann-Morgenstern utility function u assigns a value $u(a_i)$ to each outcome a_i; hence the utility of a_i. The utility of a lottery then corresponds to the sum of utilities of different outcomes a_i weighted with their probability p_i (Varian, 1999, p. 219). The utility function $u : L \to \Re_+^n$ is in the *expected utility form* if and only if it is linear, i.e. if and only if it satisfies the property

$$u\left(\sum_{k=1}^{K} \alpha_K L_K\right) = \sum_{k=1}^{K} \alpha_K u(L_K) \tag{2.17}$$

for any K lotteries $L_K \in \mathcal{L}$, $k = 1,..., K$, and probabilities $(\alpha_1,..., \alpha_K) \geq 0, \sum_k \alpha_k = 1$. The expected utility property is a *cardinal* property of utility functions defined on the space of lotteries and is *unique up to an affine transformation*.[6] Applying an affine transformation to an expected utility function yields another expected utility function representing the same preferences. Any other kind of transformation infringes the expected utility property (Varian, 1999, p. 219).

An important aspect in the context of decision making under uncertainty certainly is the consumer's attitude towards risk. As illustrated in figure 2.2, the gradient of an ordinary von Neumann-Morgenstern utility function indicates an individual's risk attitude.

[6] An affine transformation is a function that preserves all affine combinations. An affine combination is a linear combination in which the sum of all coefficients equals one.

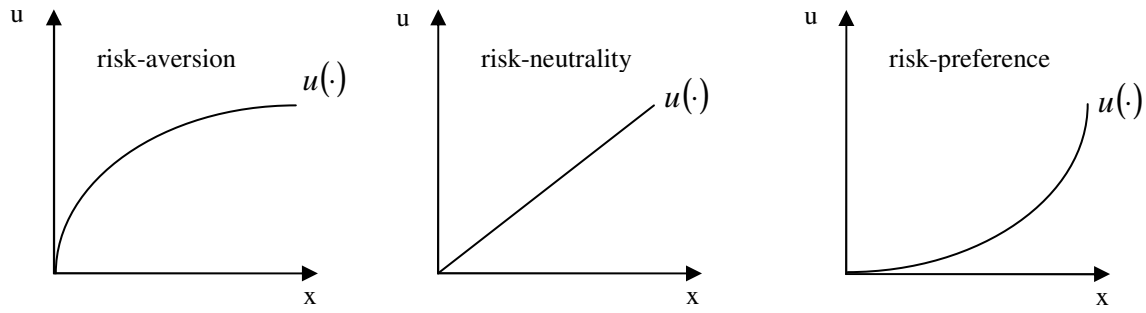

Figure 2.2 Consumer's Risk Attitude within a von Neumann-Morgenstern Utility Function

A person is defined as *risk-averse* or displays *risk-aversion* if he strictly prefers a certainty consequence to any risky prospect whose mathematical expectation of consequences equals that certainty, $u(E(l)) > u(l)$. His utility function is strictly concave. In case he strictly prefers a risky prospect to any certainty consequence whose mathematical expectation of consequences equals that risky prospect he is understood to be a *risk-preferrer* or displays *risk-preference* and his utility function is strictly convex, $u(E(l)) < u(l)$. If the consumer is indifferent to both the certainty consequence and a risky prospect, $u(E(l)) = u(l)$, he is defined as *risk-neutral* or displays *risk-neutrality*. The consumer has a linear utility function (Hirshleifer and Riley, 1992, p. 23).

To recapitulate, the consumer attempts to maximise the expected value of utility in an environment of uncertainty. Provided that his utility function complies with the expected utility form, a von Neumann-Morgenstern expected utility function indicates the consumer's preference relation over different lotteries. In this context, the consumer's attitude towards risk appears to be decisive.

2.3 A Critical Assessment

Following the elementary work of von Neumann and Morgenstern, the expected utility theory has dominated the analysis of decision making under uncertainty in the last decades (Deaton and Muellbauer, 1999, p. 382). In spite of its many advantages, however, there are certain objections to the approach that prima facie appear to have considerable force. The first demur questions the consumer's portrayal as a homo oeconomicus whose behaviour is solely determined through the rationality principle and doubts the relevance of expected utility as the consumer's sole aim of maximisation (Deaton and Muellbauer, 1999, p. 388). In the neoclassical demand theory, consumers are assumed to *always* act rationally in their pursuit of maximising expected utility and consistently choose the preferred alternative. Yet, any

observation of irrational behaviour refutes to the rationality principle (Lipsey et al., 1993, p. 160; Hardes and Schmitz, 2000, p. 126). Consumers do not always comply with the axioms of the Expected Utility Theory which implicates that they only feature a *bounded rationality* (Kahneman and Tversky, 1979, p. 263). As restraining the consumer to simply obeying the rationality principle generally falls short of realistically portraying consumer behaviour under uncertainty, particularly psychological literature on risk perception suggests considering the formation of risk perceptions and the nature of individual decisions (Thaler and Rosen, 1976; Viscusi, 1979).

The second objection implies that exclusively *homogenous* commodities are considered. As a consequence, the specific product characteristics remain disregarded. This corresponds to a loss of information. Hence, this analysis will focus on the more realistic assumption of *heterogeneous* products albeit violating the properties of a market with perfect competition.

The development of the previous subsection has followed the comprehension of the expected utility model generally accepted as a *normative model* of rational choice in economic behaviour (Kahneman and Tversky, 1979, p. 263). The scope of normative economics involves value judgements and cannot be discussed by reference to objective facts alone. With respect to the commitment to values, normative economics gives a judgement of what *ought* to be and therefore is partially restricted in terms of predicting consumer behaviour (Eaton and Eaton, 1991, p. 15).

Positive economics, by contrast, refrains from value judgments and offer a description of what is the case and attempts a prediction of what might be. Its task is to provide a system of generalisations that can be used to make correct predictions about the consequences of any change in circumstances. Positive economics is in principle independent of any particular ethical position or normative judgments. Its performance is to be judged by the precision, scope, and conformity with experience of the predictions it yields (Friedman, 1953, p. 4). This is illustrated in the case of building a model for the purpose of explaining real phenomena as in chapter four, for example.

2.4 Summary

The previous subchapters provide a brief insight into the economic theory of consumer behaviour. In the neoclassical demand theory presented first, consumer behaviour might be understood as maximising utility under budget restrictions in a simplified context. The consumer is portrayed as a homo oeconomicus whose behaviour is solely determined through

the rationality principle. He operates on a market with perfect competition and his preference relation over available commodity bundles is represented through a continuous, real-valued utility function.
Subsequently, these assumptions of the traditional demand theory are being altered. The consumer now operates in an environment of uncertainty in which he attempts to maximise the expected value of utility, denoted through a von Neumann-Morgenstern expected utility function which states the consumer's preference relation over different lotteries. In conditions of uncertainty, the consumer's attitude towards risk is relevant.

Still, despite the evident advantages of this approach, only little emphasis is put on analysing demand regarding aspects of *individual behaviour* or the *impact of information*. The following chapter will thus include approaches from behavioural sciences or information economics into the analysis.

3 Comprehensive Approaches to Consumer Behaviour

The previous chapter gave a detailed review of the economic principles of consumer theory in an environment of uncertainty. Regardless of its fundamental significance, the approach does not include other than microeconomic neoclassical determinants of consumer behaviour. Hence, the neoclassical approach needs to be complemented through certain aspects of related subjects such as *Behavioural* or *Informational Economics* in order to comprehensively describe the motives behind the consumer's behaviour.
The following subchapter will provide a brief insight into approaches from behavioural science to facilitate the understanding of the complex issue of consumer behaviour. Special emphasis will be placed on the interaction between consumers, their attitude and the respective behaviour, predominantly within the scope of the *Attitude* and *Attitude Change Theory*. The second subchapter will underline yet another aspect of consumer behaviour. It will highlight the impact of information which is illustrated within a framework of Informational Economics. In particular, consumers' reactions to information in an environment of imperfect information shall be presented. The third subchapter will give a review of approaches combining both behavioural and informational aspects. The element of *trust* as a strategy to reduce the consumers' ignorance will be introduced to the analysis. Finally, the fourth subchapter will reformulate a slightly modified version of the *Theory of Planned Behaviour* against the background of Behavioural and Informational Economics. This is of particular importance for the further development of a model for the purpose of explaining

consumer behaviour in risky markets and market aggregate outcome. The chapter will conclude with a compendious summary.

3.1 Approaches from Behavioural Economics

No scientific paradigm, taken alone, can provide a comprehensive explanation of so complex a field as consumer behaviour. In fact, any approach that attempts to combine the several aspects of the behavioural processes influencing consumer behaviour requires a *multidisciplinary* method of resolution. This issue is formally addressed within Behavioural Economics.

Behavioural Economics combine the perspectives of academics as multifaceted as economics, marketing or (social) psychology and yield insights not made available by unidimensional approaches. Research on consumer behaviour can benefit from an accurate appreciation of the ontological and methodological enhancements of such proceeding.

3.1.1 Principles of Approaches from Behavioural Science

The underlying principle of Behavioural Economics is of *cognitive* manner. It suggests that an individual's attitude towards a product, service or some other object depends on the thoughts individuals rehearse in response to incoming information (Sternthal and Craig, 1982, p. 62). This concept, featuring the coherence between *attitudes*, *information* and *behaviour*, is among the most investigated and best established subjects of consumer research. It is generally referred to as the *Attitude Theory*.

The scope of this section lies on illustrating the determinants of consumer behaviour according to the Attitude Theory. Thus, *attitude* and adjacent aspects such as *beliefs* and *intentions* shall be investigated with respect to their impact on consumer *behaviour*.

Of these aspects of the behavioural processes mediating influence on consumer decision making probably the most widely studied have been individuals' *attitudes*. These are generally defined as 'a learnt predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object' (Fishbein and Ajzen, 1975, p. 12). Whereas attitude refers to a consumer's evaluation of an object, *beliefs* represent the information the individual has about the object. Specifically, a belief links an object to some attribute. *Intentions* are in many respects regarded as 'a special case of beliefs, in which the object always is the consumer himself and the attribute always is behaviour' (ibidem, p. 12). *Behaviour* itself, finally, is the observable action of a consumer.

As to the classical understanding, attitudes are assumed to consist of three distinguishable components, each of which is based on relatively distinct sources of information (Zanna and Rempel, 1988, p. 317). These are the

- *Cognitive Component*. The consumer's perception, his knowledge and beliefs of an object reside within the cognitive component, also known as the 'belief stage'.
- *Affective Component*. It represents the consumer's feelings of like or dislike towards an object.
- *Conative Component*. It refers to the consumer's action or behavioural tendencies toward the attitude object and is also known as the 'intention stage' (Engel et al., 1993, p. 323).

The interaction of these components of attitude determines the consumer's behaviour as illustrated in figure 3.1 (Kuß and Tomczak, 2000, p. 47). The extent to which these components are consistent with each other will vary considerably as a function of the attitude object, the context and the consumer himself.

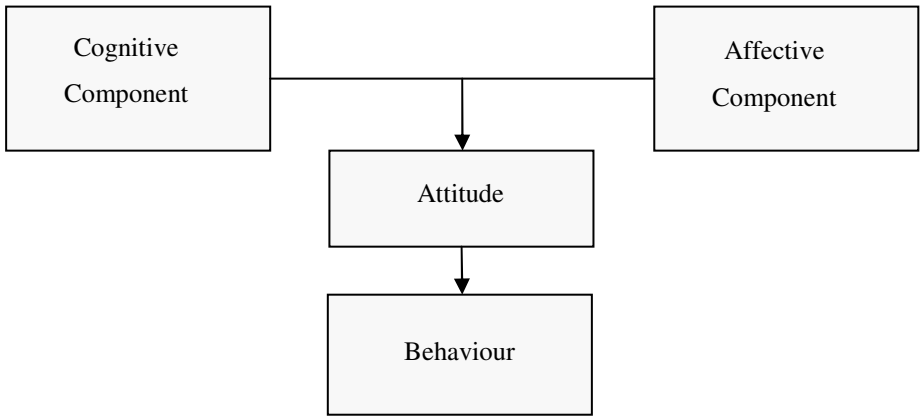

Figure 3.1 Classical Determinants of Attitude and Behaviour
Source: Kuß and Tomczak, 2000, p. 47.

Based on the cognitive perspective, an analysis featuring the importance of attitude in behavioural economics emphasises both the cognitive and affective component. Particularly with regard to the prevailing doctrine, the cognitive component of attitude is considered to be decisive for the consumer's evaluations and thus his behaviour (Engel et al., 1993, p. 332). Elements residing within the cognitive component are regarded as a major determinant of the evaluations comprising the affective component, which, in turn, is positioned as influencing

the conative component, as reflected within figure 3.2. The relevance of the conative component will not show to advantage until the Theory of Planned Behaviour will be discussed in chapter 3.4.

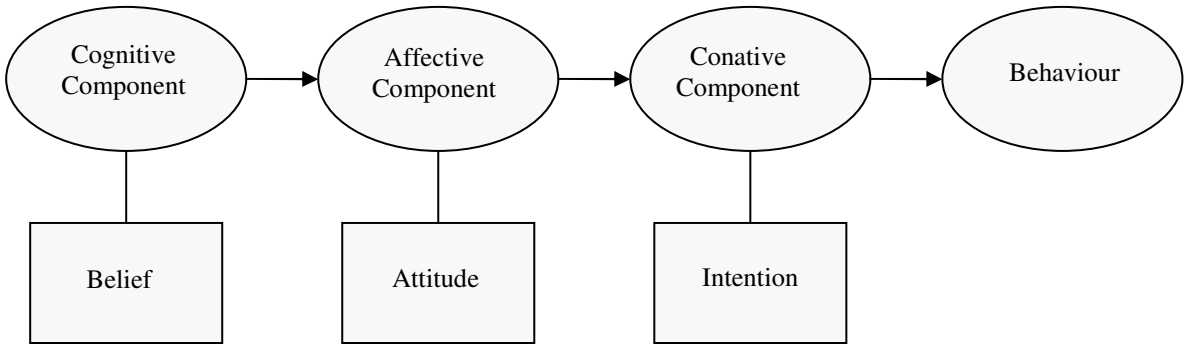

Figure 3.2 The Cognitive, Affective and Conative Components of Attitude
Source: Modified from Engel et al., 1993, p. 323.

In contrast to the prevailing doctrine, the tripartite division used to characterise attitude has been publicly questioned. Even a complete renunciation has been demanded (Tesser and Shaffer, 1990, p. 480). Due to a lack of feasible alternatives, however, none of the alternatively proposed approaches became commonly accepted. Still, rather than conceptualising attitudes as possessing three different components, it was suggested to focus only on the affective component. The remaining components, while closely related to attitudes, were viewed as distinct entities (Engel et al., 1993, p. 323).

Still, the tripartite division used to characterise the components of attitude seems well suited for the concerns of this subchapter since *all* components, even though not to the same extent, are crucial to the understanding of consumer behaviour. Traditionally, research has focussed on the cognitive component of attitude in explaining the attitude's impact on consumer behaviour. From a cognitive perspective, attitude is regarded as depending on *knowledge* and *information* about the attitude object. Consequently, emphasis is placed on ascertaining the importance of beliefs the consumer holds about the attitude object. These beliefs typically involve perceived associations between the attitude object and various attributes.

The above section has demonstrated that a unidimensional approach to the phenomena *attitude* is not reasonable. Attitudes consist of different components and many attributes. Although several different explanatory theories have been proposed in literature, an explanation of the consumer's attitude and behaviour is predominantly conducted within the

scope of multi attributive models (Engel et al., 1993, p. 332). In their outer appearance, these models are similar to the *semantic differential* but offer a more specific technique of combining multi dimensional components.[7]

In the following, classical model types which have been developed from established consumer behaviour theory will be outlined in their basic structure. The perhaps best known is Fishbein's (1963) *Multi Attribute Attitude Model*.

3.1.2 The Impact of Attitude on Consumer Behaviour

The preceding subchapter provided conceptual definitions of attitude, belief, intention and behaviour, as well as a brief outline of a theoretical structure linking these concepts. Since these matters occupy a crucial role in consumer research, the following paragraphs will present a review of some contemporary theories of attitude. A succinct description of each theory will be provided and their implications for a better understanding of the relationship between attitude and consumer behaviour will be examined.

Most contemporary attitude theories have their origins in two major schools of thought. Whereas the various *learning theories* of attitude are based on the *stimulus-response approach* of behaviour theory, most theories of *cognitive consistency* are influenced by the cognitive approach of field theory. A distinction is therefore usually made between *behaviour theories* of attitude and *cognitive consistency theories* (Fishbein and Ajzen, 1975, p. 21). Despite their ostensible differences, these approaches can be ascribed to the simple neo-behaviouristic *stimulus-organism-response (SOR) paradigm* illustrated in figure 3.3.

Figure 3.3 The SOR Paradigm
Source: Kuß and Tomczak, 2000, p. 3.

The stimulus-organism-response paradigm is based on the assumption that certain stimuli are processed in the organism, i.e. the consumer, and afterwards *always* lead to a reaction. Yet,

[7] The semantic differential was developed by Osgoord, Suci, and Tannenbaum (1957) as a technique for measuring meanings. It will not be subject of this publication.

this scheme does not commence automatically, but tries to integrate the consumer's complex and unique past experiences into his behaviour. It is commonly accepted that residues of certain experiences influence or modify consumer's behaviour (Fishbein and Ajzen, 1975, p. 9). Attitudes are generally assumed to constitute such residues and are hence considered to be learnt.

Furthermore, with respect to the definition of attitude, the consumer's actions towards an object are *consistently* favourable or unfavourable. Within the context of response consistency, at least three different types can be distinguished.

- The first type, the so called *stimulus-response consistency*, can be understood as the reflection of an attitude towards an object. Most definitions, however, fail to distinguish attitude form other concepts such as habit or motive. This problem can at least be partly resolved by requiring that each response indicates a certain degree of favourableness towards the object considered.
- The *response-response consistency*, as a second interpretation, involves the degree of consistency between different responses with respect to the same object. Instead of the requirement that the same responses be made with respect to an object, they should be consistent with one another. This concept can be regarded as an indication of attitude towards an object.
- The *evaluative consistency* as a third type of response consistency is related to multiple behaviours at different points in time. Even in the absence of stimulus-response or response-response consistency, a consumer may exhibit different behaviours with respect to an object.

The classification of contemporary attitude theories into learning versus consistency theories, however, conceals the distinction between a theory's *explanans* and its *explanandum*. For that reason, the present review disregards the distinction between learning and consistency theories in favour of a more unified presentation. This measure seems reasonable since the better part of approaches designated to illustrate the complex process of attitude formation can be interpreted in terms of the *expectancy-value theory*.

The expectancy-value theory generally understands behaviour as a function of the consumer's expectancies and the value of the goal which he tries to achieve. In case of more than one

possible behaviour the consumer is assumed to choose the behaviour with the best combination of expected success and value (Engel et al., 1993, p. 319). Attitude, in this context, is the *subjective value* a consumer associates with an object which in turn depends upon the consumer's subjective values for the object's several attributes (East, 1990, p. 69). In contrast to unidimensional approaches, these attributes and their impact on consumer behaviour are investigated in multi attribute attitude models. Moreover, multi attribute attitude models also emphasise the *salience* of attributes.

Salience represents the *relative* influence any attribute might have on attitude. Its impact can vary substantially with respect to the importance assigned through the consumer in forming their attitudes, since attitudes might be regarded as a function of the consumer's (limited) salient beliefs at a given point in time (Engel et al., 1993, p. 332). Although salient beliefs are assumed to determine the consumer's attitude, multi attribute attitude models are not predicated on the formulation of causality. They merely deal with the relationship between beliefs and attitude.

The perhaps best known formulation of the expectancy-value theory is Fishbein's (1963) *Multi Attribute Attitude Model*. Fishbein provides a detailed description of an integration process of how evaluative mediating responses combine to produce a consumer's overall attitude (Fishbein and Ajzen, 1975, p. 27). According to the approach, a given stimulus object may elicit a variety of responses that refer to the characteristics or attributes of the object. These stimulus-response associations are learnt through conditioning processes in which the strength of an association is a function of the number of conditioning trials. This implies that belief formation is in fact learnt. Whenever a belief is formed, some of the implicit evaluation associated with a response constitutes an attitude which may have been formed as the result of prior conditioning. The implication of this *conditioning paradigm* is that attitude towards an object is related to beliefs about an object (Fishbein and Ajzen, 1975, p. 29). This relationship is an explicit part of Fishbein's Multi Attribute Attitude Model, which can essentially be stated as follows.

- An individual holds beliefs about any given object, i.e. many different characteristics, attributes, values, and goals are positively or negatively associated with a given object.
- A mediating evaluative response, i.e. an attitude, is associated with each of these 'related objects'.

- These evaluative responses summate.
- Through the mediation process, the summated evaluative response is associated with the attitude object.
- Thus, on future occasions the attitude object will elicit this summated evaluative response, i.e. this attitude.

According to the theory, an individual's attitude towards an object is a function of his beliefs about the object and the evaluative aspect of those beliefs. Algebraically, it can be stated as

$$A_0 = \sum_{i=1}^{n} b_i e_i \,, \tag{3.1}$$

where A_0 is the attitude towards the object, b_i the strength of the belief that the object has attribute i, e_i the evaluation of attribute i, and n the number of beliefs (Fishbein, 1963, p. 233). According to the model, a consumer's attitude towards an object is a function of the strength with which he holds his beliefs and his evaluations of each attribute. The attitude towards an object can be estimated by multiplying the consumer's evaluation of each attribute associated with the object by his subjective probability that the other object has that attribute and then summing the products for the total set of beliefs. Similarly, a person's attitude can be estimated by multiplying his evaluation of each of the behaviour's consequences by his subjective probability that performing the behaviour will lead to that consequence and then summing the products for the total set of beliefs (Fishbein and Ajzen, 1975, p. 223). It is apparent that consumers holding the same beliefs may have very different attitudes and that consumers holding different beliefs may have the same attitudes.

The Multi Attribute Attitude Model outlined above is concerned with the relationship between beliefs and attitude. Interestingly, other approaches yield similar formulations in attempts to account for overt consumer behaviour. In an environment of uncertainty, consumers usually only have their *subjective* judgements of probability and value. Still, they can engage in processes that yield a subjective optimality by choosing the alternative with the highest subjective value of an attribute (East, 1990, p. 69). The approach accommodates the idea that, in purchasing certain products, the consumer acquires a bundle of expected benefits and disbenefits. One of the first to express these ideas was Edwards (1954), referring to his theory as the *Subjective Expected Utility* (SEU) model of decision.

According to the Subjective Expected Utility theory, a consumer will select that alternative which yields the highest subjective expected utility, i.e. the alternative which is likely to lead to the most favourable outcomes when he has to make a behavioural choice. The subjective expected utility of a given alternative is defined as

$$SEU = \sum_{i=1}^{n} SP_i U_i \,, \tag{3.2}$$

where SEU is the subjective expected utility associated with a given alternative, SP_i is the subjective probability that the choice of this alternative will lead to some outcome *I*, U_i is the subjective value or utility of outcome *I*, and *n* is the number of relevant outcomes. Assuming that the subjective probability SP_i is similar to b_i, the strength of the belief that the object possesses attribute *i*, and that the utility U_i is associated with e_i, the evaluation of attribute *i*, equation 3.2 can be reinterpreted as the consumer's attitude A_B towards the behaviour. Equation 3.2 can then be rewritten as

$$A_B = \sum_{i=1}^{n} b_i e_i \,. \tag{3.3}$$

Thus, the Subjective Expected Utility model assumes a direct link between the consumer's subjective expected utility and behaviour. Unlike in the Multi Attribute Attitude Model, however, no direct relationship between the consumer's attitude A_B and his behaviour can be derived from the above approach (Fishbein and Ajzen, 1975, p. 21).

Despite the high level of attention afforded to both Fishbein's Multi Attribute Attitude Model and Edward's Subjective Expected Utility Model the perhaps first model to be introduced in an explicit expectancy-value context in the attitude area was Rosenberg's *Instrumentality-Value Model* (Rosenberg, 1956, p. 368). His theory of cognitive-affective consistency particularly focuses on the effects of inconsistencies among beliefs, attitudes, intention and behaviour.

The Instrumentality-Value Model is based on the assumption that consumers evaluate objects according to how they satisfy their needs. In contrast to the previous approaches, a consumer's attitude towards an object now depends on both the consumer's value importance

(*affective component*) and his subjective opinion of the object's perceived instrumentality (*cognitive component*). The more the consumer's attitude is favourable towards an object, the more this object is *instrumental* to obtaining positively valued consequences or to preventing negatively valued. Algebraically, this concept of consumers' attitude can be expressed as

$$A_0 = \sum_{i=1}^{n} I_i V_i \,, \tag{3.4}$$

where I_i is the instrumentality, i.e. the probability that the object would facilitate or prevent the attainment of a value *i*, V_i is the value importance, i.e. the degree of satisfaction or dissatisfaction the consumer would experience if he obtained value *i*, and *n* is the number of value states (Rosenberg, 1956, p. 367). Taking into account that the Instrumentality-Value Model also deals with beliefs about an object and associated evaluations, it is of little surprise that the concept described in equation 3.4 is similar to the conclusions of both the Multi Attribute Attitude Model and the Subjective Expected Utility Model (Fishbein and Ajzen, 1975, p. 32). However, whereas the Multi Attribute Attitude Model was established within the framework of Behavioural Science, the Instrumentality-Value Model was strongly influenced by the so-called *functional* approach to attitudes. This approach is based on the assumption that attitudes and consequently attitude formation and change prove to be expedient for the consumer's purposes. They allow the consumer to achieve certain value states.
In his later work, Rosenberg extended his understanding of attitude by including beliefs within the concept (Rosenberg, 1965, p. 124). This expansion was accompanied by an explicit statement of affective-cognitive consistency.

Finally, it is worth noting that the Multi Attribute Attitude Model accounts for the relation between beliefs and attitude in terms of conditioning processes, whereas the Instrumentality-Value Model emanates from the need for a cognitive-affective consistency. Nevertheless, both models feature considerable structural similarities, and the basic hypothesis of each formulation can be described by the same algebraic expression as in equation 3.1.
The analysis of the relationship between beliefs and attitude is consistent with the conceptual framework of the following chapters. These are also based on the assumption that a consumer's attitude towards an object is a function of his beliefs.

3.1.3 A Logical Enhancement: Attitude Change and Consumer Behaviour

Of all the issues studied in the attitude area, the question of *attitude change* has undoubtedly received the most widespread attention. Whilst the previous section regarded attitudes as an inalterable determinant of consumer behaviour, the underlying principle of this section presumes that by means of changing the attitudes of individuals it is possible to influence their behaviour (Fishbein and Ajzen, 1975, p. 387). Comprehensively illustrating the process of decision making and particularly the impact of attitude change might yield valuable insights into consumer behaviour under uncertainty.

It has traditionally been assumed, not without vehement protest, however, that attitudes are intimately related to behaviour (Engel et al., 1993, p. 190). This is consistent with Fishbein's (1963) principle that an individual's attitude towards some object is a function of his beliefs about the object. Unfortunately, solid research evidence on the relationship between attitudes and behaviour is not extensive.

In one of the earlier studies, LaPiere (1934) could not succeed in deriving behaviour from written statements presumably reflecting attitudes.[8] Thus, he concluded that 'it is considerably more likely that attitudes will be unrelated or only slightly related to overt behaviour than that attitudes will be closely related to actions' (Wicker, 1969, p. 73). Further research encountered a similar dilemma (DeFleur and Westie, 1958, p. 671).
However, the majority of studies demonstrate rather convincingly that knowledge of attitudes provides a realistic basis for predicting behaviour (Engel et al., 1993, p. 191). This process will be comprehensively illustrated in the following paragraphs.

In the context of the currently prevailing methodology it is nearly undisputed that attitudes affect both the consumer's perception and his behaviour. Generally, it is assumed that a change in attitudes precedes a corresponding change in behaviour (Engel et al., 1993, p. 328). *Attitude change* is commonly defined as 'a change in one of the dimensions of attitude' (ibidem, p. 284). Mostly, a change in one attitudinal dimension will lead to a corresponding change in other components because of the pervasive tendency for the individual to resolve and overcome the *cognitive inconsistency* that is produced. This aspect of cognitive inconsistency is the basis of Festinger's (1957) *Theory of Cognitive Dissonance*.

[8] LaPiere sent letters to hotels and restaurants asking them whether they would accept members of the Chinese race as guests in their establishment. An attempt was made to relate this measure of attitude to the actual acceptance of a Chinese couple that visited those establishments.

According to the Theory of Cognitive Dissonance, an individual aims at reducing the dissonance between its own point of view and some voluntarily perceived input of information (Brehm and Cohen, 1962, p. 26). The basic hypothesis states that 'The existence of dissonance, being psychologically uncomfortable, will motivate the person to try to reduce the dissonance and achieve consonance. The strength of the pressure to reduce the dissonance is a function of the magnitude of the dissonance' (Festinger, 1957, p. 18).

Considering a dissonant pair of cognitive elements the magnitude of dissonance increases with the importance of the elements to the individual. However, a given element may have relevant relations to more than one other element. More formally, these ideas can be expressed as

$$D_k = \frac{\sum_{d=1}^{n} I_d}{\sum_{d=1}^{n} I_d + \sum_{c=1}^{m} I_c} \tag{3.5}$$

where D_k is the magnitude of dissonance associated with cognitive element *k,* I_d is the importance of the dissonant element *d*, I_c is the importance of consonant element *c, n* is the number of cognitive elements in a dissonant relation with element *k*, and *m* is the number of cognitive elements in a consonant relation with element *k* (Fishbein and Ajzen, 1975, p. 40).

Regarding the previous formulations, it might be assumed that the probability of change varies inversely with *attitude strength*. This generalisation, however, is little more than a platitude unless the underlying determinants for attitude strength can be clarified.

- 'Attitudes about an object are more subject to change through contradictory incoming information when the existing mass of stored information about the object is smaller' (Newcomb et al., 1965, p. 91).
- Attitudes that posses *centrality* are most resistant to change. Centrality is a function of the extent to which the object is intimately related to the self concept, important values, or motives of the individual.
- Attitudes that are highly interconnected with others tend to resist change. Individuals usually strive to retain balance in an attitude system. Change in one

generally leads to change in another. Change is resisted, however, and it becomes less likely when these interconnections are high.

- Incoming information is likely to be evaluated on its own merits. It will provoke a change to that extent to which the individual is open minded and not dogmatic in his beliefs (Engel et al., 1993, p. 192).

The most observable outcome of these four determinants is strong commitment to the consumer's point of view. Indeed, commitment is the underlying postulate of several theories pertaining to psychological balance and resistance to change. Unless commitment is present, the individual would be less prone to reject contradictory information and would assimilate the input more readily. Hence, the impact of information from various sources on consumers' attitudes and acceptance is likely to be heavily influenced both by factors relating to the information itself and by factors relating to the sender of the information. It can be concluded that there is a positive, linear relationship between message discrepancy and attitude change when the message is attributable to a highly credible source (Engel et. al., 1993, p. 326). Generally, it is easier to achieve an attitude change when the source is trustworthy and an expert in the related field. The issue of trust and its impact on consumer behaviour will be of utmost importance for the course of investigation in subchapter 3.3 and as an element of the Theory of Planned Behaviour in subchapter 3.4.

3.1.4 A Critical Assessment

In spite of the valuable results and many thought-provoking impulses; Behavioural Economics in general and the Attitude Theory in particular face certain differences. Since Behavioural Economics as a multidisciplinary approach comprises a multitude of different formulations, drawing general conclusions is complicated by the fact that studies vary in methodology and level of abstraction (Bredahl et al., 1998, p. 255).

One of the central theories in this field is the Multi Attribute Attitude Theory. Its fundamental element is a multiplicative combination of the model's components and their adjacent addition. Although the procedure is evident at first glance, it necessarily requires the independence of all components (Kroeber-Riel and Weinberg, 1990, p. 198).

A review of the literature on Attitude and Attitude Change Theory raises a question about the *types of beliefs* determining attitudes. Accordingly, beliefs are either *attitudinal*, as in the context underlying this article, or *reportorial*, i.e. purely descriptive. Indeed, with very few exceptions, literature tends to ignore reportorial beliefs in their investigations of attitudes

(Fishbein, 1963, p. 234). The prevailing view, as illustrated above, assumes that all beliefs about an object are related to an individual's attitude since all beliefs about an object contain an evaluative aspect. This also accounts for beliefs about risks and benefits which are important determinants of attitudes. Generally, perceived risks can be considered to influence attitudes negatively, while perceived benefits can be assumed to influence attitudes in a positive direction. Perceptions of greater benefits allow a certain amount of risk to be compensated for in the minds of the consumers (Bredahl et al., 1998, p. 256). Still, this constricted perspective on the attitudinal type of belief might disregard certain factors as shown in section 3.2.

Further criticism concerns the status of social cognition models as causal explanations of behaviour. These models examine consensual rationales for behaviour but refrain from identifying causal explanations for determining the motives behind individual decision making. Yet, in order to establish such causal models of the determinants of individual decision making, the major influences on an individual's choice in a particular situation first need to be identified. Therefore, a wide variety of influences, most of them complex, must be considered. Social norms, economics, competition, environment, previous exposure and knowledge, decision processes, and specific situational attitudes must all be considered. Often, these issues possess unexpected, temporary, or uncontrollable factors (Engel et al., 1993, p. 272). The following sections aim at elucidating this issue within a sound theoretical frame of reference which needs to be established before future research can comprehensively explain consumer' attitudes.

3.1.5 Summary

The previous subchapter provided a brief outline of Attitude Theory in the context of Behavioural Economics.

The central element in this context undoubtedly is attitude, characterised through its tripartite division. Furthermore, emphasis is put on the issues of belief, intention and behaviour. The coaction of these elements and their attributes is investigated within the scope of classical multi attribute attitude models. Among these are of Fishbein's (1963) Multi Attribute Attitude Model, Edwards' (1954) Subjective Expected Utility model of decision, and Rosenberg's (1956) Instrumentality-Value Model. The models' attractiveness stems from the provision of valuable insights into the motives behind consumer's decision making. Subsequently, the analysis is extended to the phenomenon of attitude change which varies inversely with attitude strength.

However, the impact of information on consumer behaviour or more recent research on elements as trust, for example, cannot be integrated satisfactorily into Attitude Theory. Furthermore, the presented multi attribute attitude models are not capable of comprehensively explaining consumer behaviour following an unanticipated external shock. This aspect will be discussed extensively in the following chapters.

3.2 Approaches from Information Economics

The preceding subchapter gave an extensive review of approaches from Behavioural Economics in order to facilitate the understanding of so complex a field as consumer behaviour. The main emphasis was placed on the element of attitude which was discussed within the framework of an expectancy-value formulation. In this context, an individual's attitude towards an object is regarded as a function of his beliefs about the object. If these beliefs are understood as one facet of a multifacetted construct such as information, the theories presented above merely describe the *integration* of information in the individual's formation of attitude.

The following subchapter will investigate the impact of information on consumer behaviour within the microeconomic framework of Information Economics. After an introductory discussion of Information Economics, the concept of information and related notions will be exhaustingly outlined. The second paragraph will illustrate the either *symmetrical* or *asymmetrical distribution of information* over consumers. Whilst the symmetrical distribution

of information is of rather theoretical interest in the context of this publication, particular emphasis will be put on asymmetrical information and its impact on consumer behaviour.

3.2.1 Information and Consumer Behaviour

The analysis of consumer behaviour has so far been based upon the simple neoclassical paradigm of a consumer's *maximisation* of the *expected value of utility*. All relevant variables within this classical microeconomic approach are the commodity's price on the one and the consumer's budget constraint on the other hand. Particularly prices are assumed to express all relevant information the consumer requires for the process of decision making in an environment of certainty (Grossman, 1981, p. 541).

As illustrated in chapter 2.2, however, consumers are no longer assumed to act on a market which complies to the assumptions of a perfect competition. Their behaviour can thus no longer be comprehensively explained by means of the aforesaid variables exclusively. Besides, the assumption of consumers' perfect information about the state of nature needs to be relaxed in order to present a more capacious image of reality. Consumers will now act under *incomplete information*. Since they still behave according to their characterisation as a homo oeconomicus, consumers will attempt to reduce their *state of uncertainty* (Hirshleifer and Riley, 1992, p. 299).[9] This might be achieved through an attempt to acquire additional information about the future realisation of the states of nature.

3.2.2 Principles of Information Economics

Information Economics principally deals with the analysis of economic systems considering individuals that act in an environment of incomplete information. Whilst on the one hand individuals decide and act under uncertainty, their possibilities to process and communicate the information that could moderate their uncertainty are on the other hand clearly limited. These constraints are integrated in the theoretical framework of Information Economics through the previously explained principle of *bounded rationality*.

The economics of information is generally considered as an enhancement of the economic aspect of uncertainty. Uncertainty refers to a situation where no objective classification on behalf of the consumer is possible (Knight, 1921, p. 226). Thus, uncertainty can be understood as the dispersion of an individual's subjective probability distribution over

[9] Criticism to the assumption of additional information as a means to reduce uncertainty is to be found in Schneider (1995), among others. Schneider (1995) remarks that a simple change in knowledge cannot be equated to a reduction of uncertainty.

possible states of nature (Hirshleifer, 1973, p. 31). The denotation of information, however, is not clearly outlined but comprises several different meanings (Hirshleifer and Riley, 1992, p. 167). Any definition should therefore capture the essential nature of the information phenomena in a precise description. While making explicit the similarities between information and other related concepts such as *knowledge*, *news*, *beliefs*, or *messages*, it should – at the same time – bring forward the differences between these concepts (Losee, 1997, p. 260).

- Information is regularly understood to mean *knowledge*, which in turn is an accumulated body of data about an individual's environment. From this perspective, information is a stock magnitude. Still, information may also denote an increment to this stock of knowledge through a message or an item of *news*.

- Terms like *information*, *news*, or *knowledge* are generally understood to refer to *objective evidence* about the world. *Belief* is the subjective correlate of knowledge. Increments of objective knowledge lead rational individuals to revise their beliefs. Ultimately, however, decisions must be based upon subjective beliefs. The assumption of news as objective information will be relaxed in the following (Swinnen et al., 2003, p. 151).

- The term *message* is generally taken to mean an intended communication from one person to another. *News* is somewhat more general and may refer to evidence or data arrived at by some process other than interpersonal communication. Yet, both terms will be treated synonymously in the following.

For the purpose of this publication, *information* in the narrower sense will in the following be defined as 'that portion of piece of news which is new for the recipient'. Thus, information can be understood to change the individual's subjective probability distributions over possible states of nature (Losee, 1997, p. 256).

The examinations of the previous subchapters have focussed on situations in which individuals act under conditions of *perfect information* about the state of the world. In the following sections this feature will be relaxed by considering the possibility that the information is not perfect. In doing so, it needs to be distinguished between the case of

symmetric information and the case of asymmetric information, where new conceptual problems arise.

3.2.2.1 Symmetric Information

The neoclassical competitive paradigm, extensively applied in economics, assumes *complete* and *symmetric information* over market participants in order to achieve a competitive equilibrium. Even if this assumption appears to be a primarily theoretical entity, the construct of symmetric information will be discussed for the sake of completeness.

In a formal manner, information is defined as *symmetric* if any two states $s, s' \in S$ are distinguishable by one consumer *i* if and only if they are distinguishable by every other consumer *k*, i.e. $\sigma_i(s) \neq \sigma_i(s')$ if and only if $\sigma_k(s) \neq \sigma_k(s')$. Thus, the occurrence of symmetric information leads to assume that *all* consumers share the same *signal function*, $\sigma_i(\cdot) = \sigma(\cdot) \forall\, i$ (Mas-Colell et al., 1995, p. 717). The term $\sigma(\cdot)$ can be understood as a *public signal*.

Symmetric information implies that the distribution of information over all consumers *ex ante* is *homogeneous*. Since apparently all consumers share the same information, the latter's economic value equals zero. This statement contrasts Stigler's (1961) assumption of information as a good that can be assigned an economic value (Stigler, 1961, p. 213). The problem of pricing information can be illustrated through Arrow's (1965) information paradox which indicates that a consumer cannot assign a value to information without knowing it. If the consumer knows the information, however, he might determine its value but the demand price would instantly be zero (Arrow, 1965, p. 37).

The assumption of a symmetric distribution of information over all consumers might be appropriate for explaining consumer behaviour in the framework of the neoclassical paradigm. Yet, the concept is no longer applicable in the case of markets that do not operate under perfect competition. These markets do not always provide *pareto optimal* allocations of scarce resources. Informational asymmetries are an important cause for this phenomenon.

3.2.2.2 Asymmetric Information

Despite its universal applicability, the predominantly theoretical concept of symmetric information is of only limited use for a comprehensive analysis of consumer behaviour. Particularly when referring to a more realistic environment than a market under perfect

competition, the assumption of an *asymmetrical* distribution of information over consumers appears to be more reasonable. In a typical situation in literature, information endowments are usually asymmetrical (Hirshleifer and Riley, 1992, p. 14).

The theory of asymmetric information is often also referred to as the theory of *imperfect* information. Considering these rather semantical differences, however, both terms will be used interchangeably in the following. Generally, asymmetric information can be defined as 'information that is known to some but not to other economic subjects' (Mas-Colell et al., 1995, p. 719).

The concept of asymmetrical information was first introduced in Akerlof's (1970) elementary paper which investigates information asymmetries on an automobile market. As one of the first approaches, the concept acknowledges the meaning of information as a market determinant (Akerlof, 1970, p. 488).[10]

In contrast to the aforesaid scenario of symmetric information, the consumers' signal functions $\sigma_i(\cdot)$ are private knowledge and not necessarily the same over consumers in the case of asymmetric information. In analogy to the case of symmetric information, every consumer observes $\sigma_i(s)$ and uses his signal function $\sigma_i(\cdot)$to update the probabilities and utility functions when state *s* occurs. The corresponding market will be cleared by a price $p(\sigma_1(s),...,\sigma_I(s))$. Note that the price $p(\sigma_1,...,\sigma_S)$ depends on *all* individual signals, i.e. it *aggregates* the information of all market participants. Yet, the price functions $p(s)=p(\sigma_1(s),...,\sigma_I(s))$ do not have to be measurable with respect to the individual signal functions $\sigma_i(\cdot)$. Consumer *i* might thus not be able to distinguish between two states $s,s'\in S$, i.e. $\sigma_i(s)=\sigma_I(s')$, whilst the market does, i.e. $p(\sigma_1(s),...,\sigma_I(s))\neq p(\sigma_1(s'),...,\sigma_I(s'))$ (Mas-Colell et al., 1995, p. 719).

In the presence of asymmetric information market equlibria often fail to be Pareto optimal. The tendency for inefficiency in these settings can be strikingly outlined by a phenomenon known as *adverse selection*. Adverse selection arises when an informed individual's trading decisions depend on his privately held information in a manner that adversely affects uninformed market participants (Mas-Colell et al., 1995, p. 436).

[10] The original authors of the theory, George A. Akerlof, Michael Spence, and Joseph Stiglitz were awarded the Bank of Sweden Prize in Economic Sciences in memory of Alfred Nobel in 2001.

3.2.2.2.1 Adverse Selection

The perhaps best-known example of adverse selection is Akerlof's (1970) investigation of information asymmetries on the market for used automobiles. On most (commodity) markets, buyers rely on public information to measure the value of a class of goods. They base their decision on the *average* of the whole market. Sellers, however, usually possess a more intimate knowledge of a specific item. Akerlof (1970) argues that this information asymmetry gives the seller an incentive to sell goods of a less than the average market quality. The average quality of goods in the market will then be reduced as will the market size (Akerlof, 1970, p. 491).

Formally, Akerlof (1970) assumes that the demand for used automobiles depends on two variables, the price *p* and the average quality μ of the used automobile traded; $Q^d = D(p, \mu)$. Both the supplies of used cars and also the average quality μ will depend upon the price, $\mu = \mu(p)$ and $S = S(p)$. Akerlof (1970) then derives an example from utility theory, assuming the existence of only two groups of traders; group one and two. Their corresponding utility functions are

$$U_1 = M + \sum_{i=1}^{n} x_i \text{ and} \tag{3.6}$$

$$U_2 = M + \sum_{i=1}^{n} \frac{3}{2} x_i \tag{3.7}$$

with *M* as the consumption of goods other than automobiles, x_i as the quality of the i^{th} automobile, and *n* as the number of automobiles. Both groups of traders maximise their expected utility in the sense of von Neumann and Morgenstern. Whilst the first group of traders is assumed to possess *N* cars with the uniformly distributed quality *x* within the interval [0, 2], the second group has no cars. Note that if μ is uniformly distributed over the interval [0, 2], the *average* value of μ will be *p/2*. The price of other goods *M* is set to unity (Akerlof, 1970, p. 491).

The traders' income is denoted by Y_1 and Y_2, correspondingly. The demand *D* for used automobiles is defined as the sum of the demands of both groups. Ignoring indivisibilities, the demand for automobiles by group one traders will be

$$D_1 = \frac{Y_1}{p} \text{ if } \qquad \frac{\mu}{p} > 1 \tag{3.8}$$

$$D_1 = 0 \text{ if } \qquad \frac{\mu}{p} < 1. \tag{3.9}$$

The supply S_1 of automobiles offered by group one traders is

$$S_1 = \frac{pN}{2} \text{ with } \qquad p \le 2 \tag{3.10}$$

with the average quality

$$\mu = \frac{p}{2}. \tag{3.11}$$

Similarly, the demand of group two traders is

$$D_2 = \frac{Y_2}{p} \text{ if } \qquad \frac{3\mu}{2} > p \tag{3.12}$$

$$D_2 = 0 \text{ if } \qquad \frac{3\mu}{2} < p \tag{3.13}$$

and their supply S_2 of used automobiles is

$$S_2 = 0. \tag{3.14}$$

Thus, total demand $D(p,\mu)$ is

$$D(p,\mu) = \frac{(Y_1 + Y_2)}{p} \qquad \text{if } p < \mu \tag{3.15}$$

$$D(p,\mu) = \frac{(Y_2)}{p} \qquad \text{if } \mu < p < \frac{3\mu}{2} \tag{3.16}$$

$$D(p,\mu) = 0 \qquad \text{if } p > \frac{3\mu}{2} \tag{3.17}$$

However, with price *p*, the average quality is *p/2* and therefore at no price any trade will take place. This occurs in spite of the fact that at any given price between zero and three there are traders of group one who are willing to sell their automobiles at a price which traders of group two are willing to pay (Akerlof, 1970, p. 491). The above phenomenon corresponds to a *complete market failure*, as illustrated in figure 3.4.

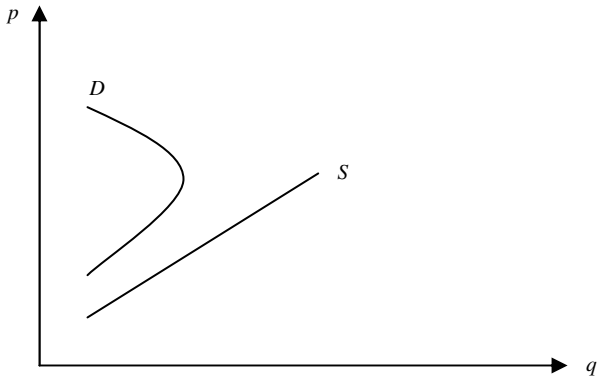

Figure 3.4 Market Failure in the Case of Asymmetric Information

The left bend of the demand curve *D* indicates that below a certain price level *p* the *average* quality *q* of used automobiles on the market is too low to encourage further demand. Regardless of the price, no trade will occur between the two groups due to the asymmetrical distribution of information over traders.

As soon as the traders dispose of symmetric information, transactions will take place and a gain of utility over the situation with asymmetric information can be observed for all parties involved (Akerlof, 1970, p. 492).

Still, it needs to be remarked that information asymmetry does not always lead to *adverse* selection. Under specific conditions, even a *favourable* selection might take place (Jovanonic, 1982, p. 537).

Literature traditionally distinguishes between two types of informational problems in the case of uncertainty, those resulting from *hidden information* and those resulting from *hidden action* (Mas-Colell et al., 1995, p. 477). Hidden information was illustrated in the context of adverse selection in the previous paragraphs and considers a situation in which individuals *ex ante* face an asymmetrical distribution of information. Hidden action, in contrast, refers to

situations in which one group of traders can *ex post* alter their behaviour to the detriment of the other group (Varian, 1999, p. 648). This is often understood as *moral hazard*.[11]

3.2.2.2.2 Moral Hazard

The probably best-known examples of moral hazard are Arrow's (1963; 1970a), Zeckhauser's (1970) and Spence and Zeckhauser's (1971) investigations of information asymmetries in the context of medical insurances.

The authors assume that individuals hold a medical insurance to cover the consequences of those actions of nature that affect them unfavourably. In case of illness, the individual assumingly bears a cost *L*. State one indicates the state of nature in which the individual falls ill and state two is the case in which this does not occur. The probability that illness occurs depends on the individual's actions. Thus, π_{1a} is defined as the probability of illness despite any precautious matters on behalf of the individual whilst π_{1b} indicates the probability of illness without the individual's precaution. Furthermore, *c* will be the cost of precautious matters whilst s_i will be the net insurance payment from the individual to the insurance. Finally, *w* will be the wealth of the consumer.

Assuming that the medical insurance wants the individual to take precautious matters, the incentive problem is

$$\max \pi_{1b} s_1 + \pi_{2b} s_2 \tag{3.18}$$

such that

$$\begin{aligned} &\pi_{1b} u(w - s_1 - L) + \pi_{2b} u(w - s_2) - c \geq \bar{u} \\ &\pi_{1b} u(w - s_1 - L) + \pi_{2b} u(w - s_2) - c \geq \pi_{1a} u(w - s_1 - L) + \pi_{2a} u(w - s_2). \end{aligned} \tag{3.19}$$

If there is no incentive problem, so that the probability of illness occurring is independent of the agent's actions, and if competition in the insurance market forces expected profits to zero, then the optimal solution will involve $s_2 = s_1 + L$. The insurance company will fully insure

[11] Literature's use of the term *moral hazard* is not entirely uniform. The term originates in the insurance literature, which first focussed on two types of informational imperfections. The *moral hazard* that arises when an insurance company cannot observe whether the insured exerts efforts to prevent a loss and the *adverse selection* that occurs when the insured knows more than the company at the time he purchases a policy about his likelihood of an accident (Mas-Colell et al., 1995, p. 477).

the individual so that his wealth is independent of whether illness occurs or not (Spence and Zeckhauser, 1971, p. 383).

When the probability of illness depends on the actions on behalf of the individual, however, then full insurance will no longer be optimal. In general, the principal aims at making the agent's consumption depend upon his choices so as to leave him the incentive to take proper care. In this case the individual's demand for insurance will be rationed. The individual would like to buy more insurance at fair rates, but the insurer will not offer such contracts since that would induce the consumer to take an inadequate level of care (Arrow, 1970b, p. 212).

In the competitive case, the participation constraint is not binding, and the equilibrium is determined by the zero-profit condition and the incentive compatibility constraint. Equations 3.20 and 3.21 determine the equilibrium $\left(s_1^*, s_2^*\right)$.

$$\pi_{1b} s_1^* + \pi_{2b} s_2^* = 0 \tag{3.20}$$

$$\pi_{1b} u\left(w - s_1^* - L\right) + \pi_{2b} u\left(w - s_2^*\right) - c = \pi_{1a} u\left(w - s_1^* - L\right) + \pi_{2a} u\left(w - s_2^*\right). \tag{3.21}$$

The central statement of the hidden action problem resulting from informational asymmetries is that individuals might *ex post* alter their behaviour to the detriment of the insurer. In case of a full insurance, the individual might abstain from all precautious matters against illness. To avoid this *moral hazard*, the insurance will aim at leaving a monetary incentive to the individual to avoid illness (Zeckhauser, 1970, p. 25).

Both hidden information and hidden action involve some form of strategic interaction among the consumers and might therefore be explained against the background of the *Principal-Agent Theory* (Varian, 1992, p. 440). The Principal-Agent Theory describes a situation of asymmetric information in which one side, the principal, attempts to induce the other side, the agent, to act in the principal's interest. Such incentives might solve the moral hazard problem in which the agent has inadequate incentives to perform. Mostly, the principal will be unable to directly observe the agent's action, but instead observes some output, *x*, which is at least partly determined by the agent's actions. The principal's problem is to design an incentive payment from the principal to the agent, $s(x)$, that induces the agent to take the best action from the principal's perspective (Varian, 1992, p. 441).

The previous section has illustrated the concept of an asymmetrical distribution of information over consumers. Generally, any asymmetrical distribution of information might involve market insufficiencies such as adverse selection resulting from hidden information or moral hazard resulting from hidden action. Under certain circumstances already discussed above, these insufficiencies might provoke a complete market failure. Despite its necessary additional analytical efforts, the assumption of an asymmetrical distribution of information over the market participants shall not be abandoned in the following since the assumption of a symmetrical distribution of information over consumers is little more than a theoretical entity in the context of a comprehensive analysis of consumer behaviour under uncertainty.

In continuation of the above argumentation, the illustration of an *asymmetrical distribution of information* will be complemented through a preliminary analysis of the *asymmetrical impact of information* on consumers' behaviour. Following an introductory investigation of *neutral* information, special emphasis will be put on both *positive* and *negative* information.

3.2.3 The Impact of Information on Consumer Decision Making

Theoretically, the importance of information might be neglected on a market that is characterised through perfect competition and a state of certainty. In such an environment which is not subject to random shocks, a consumer can make a decision on the basis of his budget restriction and preferences.

A market that does not comply with the characteristics of a market under perfect competition, however, impedes a consumer from disposing of all relevant information. The consumer faces the problem of forecasting future states of nature to reduce his individual level of uncertainty. He cannot avoid a certain risk which, assuming rational behaviour, he intends to reduce through the use of so called *risk relievers*; generally understood as 'information increasing the likelihood of product success' (Losee, 1997, p. 262). This leads to both the demand and supply of additional information.

The following sections shall characterise the nature of information and determine its particular impact on the consumer's process of decision making.

3.2.3.1 A Characterisation of Information

The implicit assumption in the extensive literature on the impact of imperfect information on consumers' behaviour is that an improvement in the *provision* of information might reduce the unfavourable effects of asymmetric information (Akerlof, 1970, p. 498, Stiglitz, 1993, p. 224). The additional information is generally assumed to be *objective* or *neutral* (Swinnen et al., 2003, p. 146).

The above assumption, however, might be reasonably misleading since the consideration disregards certain essential elements. Information is usually not provided by institutions whose objective is to foster the public good, but by organisations that have an internal incentive to select certain information items, and certain forms of information, over others in their activities of distributing information. Suppliers of information can provisionally be categorised into two groups. These are either *private sources* that follow a profit-maximising objective or *public sources* that might principally have the formal target to provide objective information. This target, however, can easily be diluted by administrators and governments that have incentives to *bias* the information (Swinnen et al., 2003, p. 150).

Correspondingly, the relevancy of allegedly neutral information is relativised for the further course of this investigation. In the following, information will not be considered as objective but exclusively as either *positive* or *negative*.

Interestingly, consumers judge positive and negative information in an *asymmetrical* manner (Burton and Young, 1996, p. 687; Herrmann et al., 1997, p. 513). A similar quantity of negative information weighs more heavily in consumer decision making relative to positive information (Smith et al., 1988, p. 518). The causale for this asymmetry observed has not been comprehensively exemplified so far.

3.2.3.2 The Impact of Positive Information

Literature's use of the term *positive information* is not entirely uniform but comprises a wide selection of fundamentally different understandings. For the purpose of this publication, positive information will be regarded as 'an *affirmative* piece of news which is new for the recipient'. Positive information can be understood to change the individual's subjective probability distributions over possible states of nature and perceived risk in a *favourable* manner (Losee, 1997, p. 264).

The impact of positive information as a market determinant has not frequently been subject to the investigation of consumer behaviour under uncertainty. Generally, more emphasis has

been put on the impact of negative information and adjacent consumers' reactions as will be shown in the following section. Still, there exists a capacious literature on the effects of *advertising* on consumers' behaviour. This closely related issue can serve as an introduction into the analysis of the impact of positive information on consumers' behaviour – presumed that positive media coverage is – to some extent – comparable to advertising. Generally, positive information can be thought of as playing a comparable role to advertising in their impact on demand, except that, whereas advertising is undertaken to explicitly increase sales, information usually does not have this objective (Nelson, 1974, p. 734).

The economic theory of the impact of positive information on consumer behaviour is not yet well developed. In one approach, positive information is regarded as a form of persuasion, altering consumer preferences. Alternatively, within the household theory of production, information can be regarded as an input to the household's production activities, the provision of which also requires inputs of goods and time. Information acts as an exogenous shifter in the household's production functions for goods and services, while preferences for the latent commodities in the utility function remain unchanged (Berndt, 1991, p. 54). Thus, positive information might generally be expected to increase demand.

The impact of positive information on the consumer's demand in an environment of uncertainty has been investigated in the fundamental studies of Smith et al. (1988) and Burton et al. (1999), among others. Based on the analyses of consumer's reactions following food safety incidences in the United States, their independent observations yield that the impact of positive information has – if at all – an only remarkably weak influence on consumer behaviour. Furthermore, the impact and duration of this weak effect is subject to a theoretical approach for which little guidance is given despite suggesting to include information as an argument of the consumer's demand function (Burton and Young, 1996, p. 688).

3.2.3.3 The Impact of Negative Information

The introductory constrictions for literature's use of the term *information* need to be applied to *negative information*, too. In the following, negative information will be understood as 'a *pessimistic* piece of news which is new for the recipient'. It might change the individual's subjective probability distributions over possible states of nature and perceived risk in an *unfavourable* manner (Losee, 1997, p. 263).

In contrast to the impact of positive information on consumer's behaviour, negative information as a market determinant has rather commonly been subject to the investigation of

consumer behaviour in an environment of uncertainty. Elementary studies featuring the importance of negative information were conducted by Swartz and Strand (1981), Smith et al. (1988), Hermann et al. (1997), and Burton et al. (1999), among others. These investigations predominantly focus on the impact of negative information on consumers' demand for food. Whilst Swartz and Strand, Smith et al., and Hermann et al. investigate food hazards in the United States, Burton et al. emphasise the economic impact of information about bovine spongiform encephalopathy (BSE) in the United Kingdom. Findings unanimously demonstrate that negative information provokes a reaction on behalf of the consumer and leads to a decline in demand for the respective food. The decline can be decomposed into a *short term* and a *long term effect*, illustrating the dynamics of the process of disseminating information.

In the short term, negative information about a good leads to an *immediate* but *transitory decline* in demand. The sudden and abrupt decrease is followed by a *slow* and often *incomplete recovery* towards previous consumption levels once the supply of information ceases. Although the decline lasts only temporarily, its impact clearly exceeds the magnitude of a sustained reduction in demand. Accordingly, a certain overreaction – immediate but short lived – can be observed in the short term (Burton and Young, 1996, p. 690).
In the long term, information provokes a *sustained* shift in consumption patterns which leads to a persistent reduction in the consumption of potentially affected goods. This process can be illustrated as follows in figure 3.5 with q as the demanded quantity and p as its respective price.

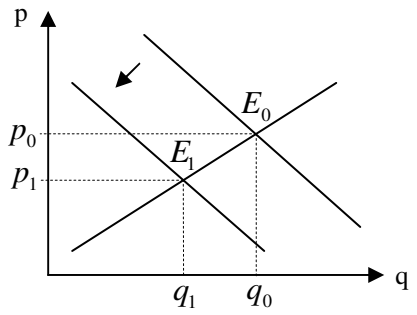

Figure 3.5 A Sustained Decline in Demand as a Long Term Effect

Yet, the observation of a decline in demand should not be mistaken for an exclusive impact of negative media coverage. It could also be the trend of a generally declining consumption of

certain foods as a result of changing tastes and preferences over time, especially when considering that the impact of negative media coverage is assumed to abate over time due to the supplying sources' declining marginal interest in the issue (Burton and Young, 1996, p. 692).

3.2.3.4 The Determinants of Asymmetric Reactions to Positive and Negative Information

As illustrated in the preceding paragraphs, consumers react asymmetrically to positive and negative information. The similar quantity of negative information weighs more heavily in consumer decision making relative to positive information (Smith et al., 1988, p. 518). Since the causale for this apparent discrepancy has so far not been comprehensively explained, the following section shall discuss possible determinants of the asymmetry in consumers' reactions.

The perhaps most decisive determinant for explaining the asymmetry in consumers' reactions is the role of (private) sources providing information. Generally, the supply of information is heavily biased towards negative information (Böcker and Hanf, 2000, p. 473). Assuming that private institutions usually follow a profit-maximising objective, particular emphasis will be put on supplying information that attracts the attention of a broad public. This mostly is (negative) information about dramatic events which was found to be of interest to nearly all segments of the population, especially, however, to a downscale audience (Herrmann et al., 1997, p. 514).

The spread of negative information is not only determined through the actual occurrence of dramatic events but through the *demand* for negative information, too. Private sources that provide information generally require a certain quantity of negative information to maintain the attention of their clientele and to sustain their (economic) position against the competitors. Von Alvensleben (1997) subsumes this paradox to the *vicious circle of selective perception* as illustrated in figure 3.6.

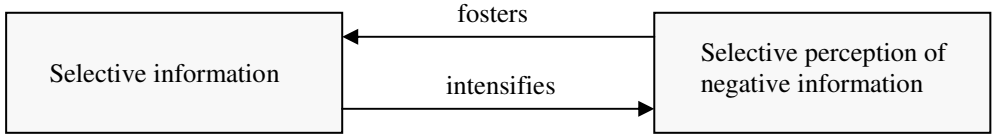

Figure 3.6 The Vicious Circle of Selective Perception
Source: von Alvensleben, 1997, p. 15.

Since *bad news is good news* – at least in economic terms for the institution supplying information, negative information will be published preferentially. These mere quantitative differences might already account for consumers' asymmetrical reactions to positive and negative information. According to the previous argumentation, an institution's (economic) incentive to supply positive information is rather small. Positive information appears to be of less interest to the public and thus does not receive a comparable level of attention. It will not be demanded as much as negative information and will not remain in the focus of interest as long as negative information but will be replaced earlier in favour of other news (Burton et al., 1999, p. 17).

The subordinate impact of positive information is further endorsed through consumers' generally *diminishing confidence* in information (von Alvensleben, 1998, p. 30). Smith et al. (1988) specify that consumers do not consider positive information to be particularly credible. Accordingly, their reactions turn out weak. Negative information, in contrast, is considered to be more credible and provokes a stronger reaction. As Swartz and Strand (1981) show, consumers understand negative information as a *warning*, particularly in an environment which is characterised through uncertainty. Negative information hence provokes precautious actions and triggers a decline in demand.

As both Hermann et al. (1997) and von Alvensleben (1998) point out, the consumers' *gender* proves to be meaningful. Whereas men react to negative information by hesitantly and disbelievingly decreasing demand, women react in a noticeably more sensitive manner. This asymmetry particularly increases in case of women (and to a lesser extent in the case of men) occupying the so-called *gatekeeper's function*, i.e. raising children or being responsible for the purchase and preparation of food.

Principally two reasons seem to determine the asymmetric impact of positive and negative information on consumers' reactions. First, the strong bias towards negative information from (private) institutions providing information needs to be mentioned. Since these sources primarily follow an economic objective, the apparently less meaningful positive information is neglected in favour of negative information. Second, positive information is generally not considered to be particularly credible and thus not assigned the importance of negative information.

3.2.4 Summary

The previous subchapters have provided a brief survey of the consequences of information as a market determinant in the microeconomic framework of Information Economics. Following an introductory characterisation of information, emphasis is put on both the symmetrical and asymmetrical distribution of information over consumers. Whereas the symmetrical distribution of information appears to be a primarily theoretical entity, the asymmetrical distribution might involve market insufficiencies such as adverse selection resulting from hidden information or moral hazard resulting from hidden action.

Following the illustration of an asymmetrical distribution of information over consumers, the asymmetrical impact of information has been investigated. A similar quantity of negative information weighs more heavily in consumer decision making relative to positive information. Reasons for this discrepancy can be ascribed to the strong bias towards negative information from the (private) institutions providing information and the little credibility of positive information.

Further determinants of consumer behaviour under uncertainty such as *trust*, for example, have not yet been introduced into the analysis. These aspects will be thoroughly discussed in the following chapter which combines approaches from both Behavioural Science and Information Economics.

3.3 Combining Approaches from Behavioural Science and Information Economics

The previous subchapters have briefly outlined the principles of the *neoclassical demand theory* and its enhancements from *Behavioural* and *Information Economics*. Prima facie, these approaches seem well suited for a comprehensive analysis of consumer behaviour under uncertainty; particularly in consideration of the fact that the consumer is traditionally portrayed as a *homo oeconomicus* whose behaviour is significantly determined through the *rationality principle*. The standard of rationality in economic theory is generally reflected in the maximisation of the consumer's subjective expected utility (Savage, 1954).

3.3.1 The Principle of Bounded Rationality

Doubtless, the rationality principle as previously characterised facilitates the modus operandi of any analysis of consumer behaviour, portraying economic agents as fully rational Bayesian maximisers of subjective utility. Yet, albeit its universal applicability and convenience, the rationality principle raises several questions such as regarding its theoretical foundation, for example. The conceptual framework of the homo oeconomicus appears to be based on

questionable premises like an environment of certainty or of consumers' utility functions being explicitly known. Furthermore, full rationality requires *unlimited* cognitive capabilities on behalf of the consumer (Selten, 1999, p. 30).

Consequently, the rationality principle was questioned by Simon (1957, p. 243) who – in reference to Information Economics – indicates that 'rational agents experience limits in formulating and solving complex problems and in processing information'. Although consumers do not deliberately act irrationally, their limited cognitive capacities impede them from achieving the level of *optimal adaptation* of means to an end. Inevitably, this leads to a discrepancy between the rationality principle posited in the neoclassical economic theory and the economic reality of human behaviour (Simon et al., 1992, p. 12).

Simon (1959) proposed the notion of *bounded rationality* for this phenomenon, presuming that the homo oeconomicus is 'a *satisficing* animal whose problem solving is based on search activity to meet certain aspiration levels rather than a *maximising* animal whose problem solving involves finding the best alternatives in terms of specified criteria' (Simon, 1959, p. 261).

Thus, consumers' decision making is understood as a *selective search process* guided by aspiration levels, i.e. a value of a goal variable which must be reached or surpassed by a satisfactory decision alternative. Satisficing comprehends that these decision alternatives are not given but *successively* determined through heuristics. These ensure the feasibility of the search and will in the simplest of all cases discontinue as soon as a satisfactory alternative which reaches or surpasses the aspiration levels of the goal variables is found. The aspiration levels are not static over time, but dynamically adjusted to every situation, i.e. they are raised in case of an easy accessibility of satisfactory alternatives and vice versa (Selten, 1999, p. 2).

Other than the mentioned cognitive limitations on the part of consumers, the principle of bounded rationality also comprises consumers' adaptation of behaviour to a manner consistent with the attainment of a given level within the limits imposed by his socio-economic *environment*. The limits imposed are not necessarily *objective* characteristics of the environment as under the rationality principle but may also be *subjective* characteristics which the consumer perceives (Simon, 1982, p. 8). In the presumingly prevailing environment of uncertainty, the subjectivity of the consumer's perception endorses the above thesis of a

discrepancy between the rationality principle and economic reality. Furthermore, in any interactive situation of complication, consumers cannot rely upon others to behave according to perfect – or *deductive* – rationality. This lack of certainty coerces them to *assume* their opponent's behaviour; unavoidably in the form of subjective beliefs. Objective statements cease to apply and, correspondingly, deductive rationality is abandoned in favour of *inductive* rationality.

Distinguishing between the consumer's objective environment in which he acts and the subjective environment that he perceives and to which he responds, obviates the explicit prediction of consumer behaviour. Even provided that the consumer behaves rationally, his behaviour can no longer be derived simply from the characteristics of the objective environment. Additional information regarding the perceptual and cognitive processes is obligatorily required.

Regarding the previous paragraphs, it appears that the rationality principle cannot remain unchanged throughout the further course of this investigation; particularly since the principal object of investigation is embedded in an environment of uncertainty. In the following, the consumer will therefore act in an only boundedly rational manner and strive for satisficing instead of maximising his subjective expected utility.

3.3.2 Bounded Rationality and the Framing of Decisions

Regardless of the perpetual academic disaccord about the impact of bounded rationality on decision making under uncertainty, the former receives fresh impetus from a *psychological perspective* on economics; generally referred to as the *framing of decisions* (Kahneman, 2003a, p. 1449).

Regarding the concept of rational choice as presented in chapter two, there is a widespread consensus among economists that rational choice should satisfy the elementary requirements of *consistency* and *coherence*. Rationality requires that preferences for particular outcomes should be predictive depending on the level of utility or disutility associated with their occurrence. Furthermore, the assumption that preferences are not affected by inconsequential variations in the description of outcomes, also referred to as *extensionality* (Arrow, 1982, p. 2) or *invariance* (Tversky and Kahneman, 1986, p. 253), is considered an essential aspect of rationality (Kahneman, 2003a, p. 1458). Yet, literature reveals certain situations, framing effects, in which consumers appear to *systematically* violate invariance (Tversky and

Kahneman, 1981, p. 453 and 1986, p. 252; Kahneman, 2003a, p. 1451 and 2003b, p. 162). Extensionally equivalent descriptions lead to different choices by altering the relative salience of different aspects of the problem. Moreover, consumers exhibit patterns of preference which appear incompatible with the Expected Utility Theory. This behavioural phenomenon can be assigned to the psychological principles underlying the consumers' perception of a decision problem and their evaluation of options. The following paragraphs will illustrate the (systematic) bias that separates the consumers' beliefs and choices from the *optimal* choices as under the rationality principle.[12]

Whereas a *general decision problem* is characterised through the options and consequences between which the consumer has to choose, and the conditional probabilities that relate actions to outcomes, the term *decision frame* refers to the decision-maker's *perception* of the actions, outcomes, and conditional probabilities associated with a *particular* choice. The frame that a decision-maker adopts is not only determined through the *formulation* of the decision problem, but also through *(social) norms*, *habits*, and *personal characteristics* of the decision-maker (Tversky and Kahneman, 1981, p. 453). Consequently, a decision can be framed in several different ways.

In a series of experiments, Tversky and Kahneman (1981) demonstrated that consumers' decisions might in fact vary massively from the *optimal* choice under perfectly rational behaviour.[13] When the former (1981, p. 455) asked 77 decision-makers to reveal their preferences regarding a sure win of $30 compared to an 80 percent chance to win $45, 78 (22) percent chose the first (second) alternative. Furthermore, when confronted with the question whether they would prefer a 25 percent chance to win $30 to a 20 percent chance to win $45, 58 (42) percent of the decision-makers (*N=81*) chose the first (second) option. Finally, in a question dealing with the response to an epidemic which could be cured through two different therapies, *A* and *B*, 35 percent of the respondents (*N=72*) preferred alternative *A*, a 20 percent chance of imminent death and an 80 percent chance of normal life, with an expected longevity of 30 years to alternative *B*, the certainty of a normal life, with an expected longevity of 18 years (Tversky and Kahneman, 1986, p. 269). Apparently, most decision-makers exhibit a distinctive *risk-aversion* which paradoxically turns into a *risk-preference* after a simple

[12] Particularly Kahneman and Tversky's (1979) *Prospect Theory* emphasises this aspect. As a precursor of the *Theory of Planned Behaviour*, it will be thoroughly discussed in the following subchapter.

[13] Tversky and Kahneman (1981) present several other examples to illustrate that decision-makers do not necessarily exhibit rational behaviour in the process of decision making.

change in the formulation of a choice problem – as illustrated in the following example (Tversky and Kahneman, 1981, p. 454). In another experiment, the decision-maker is confronted with information about the outbreak of a disease.[14] Two alternative programs, *A* and *B*, have been proposed for its combat. If program *A* is adopted, 200 persons will be saved. If program *B* is adopted, there is a probability of one third that 600 people will be saved, and a two thirds probability that nobody will be saved. Whilst 72 percent of the respondents (*N=152*) favoured program *A*, only 28 percent chose program *B*. A second group of respondents (*N=155*) was confronted with the same problem but presented a different formulation of the alternative programs. If program *C* is adopted, 400 persons will die, whereas there is a one third probability that nobody will die, and a two thirds probability that 600 persons will die if program *D* is adopted. Although the content of the issue has remained unchanged, only 22 percent favoured program *C* compared to 78 percent that chose program *D*. Thus, whereas most decision-makers exhibit a distinctive risk-aversion in the first problem, they surprisingly exhibit a risk-preference after rearranging the problem's formulation. Whilst choices involving *gains* are often found to be risk-averse, choices involving *losses* are often risk-preferring (Tversky and Kahneman, 1981, p. 453).[15] This common pattern of inconsistent responses arises from the conjunction of a framing effect with contradicting attitudes towards risks involving gains and losses. It is furthermore substantiated through the consumers' *distorted perception of risk*.[16]

Although these studies certainly cannot claim any representativeness, they do strikingly illustrate that consumer behaviour under uncertainty does not correspond to the assumptions of the rationality principle. The impossibility of invariance raises significant doubts about the descriptive realism of rational choice-models (Tversky and Kahneman, 1986, p. 457). Absent a system that reliably generates appropriate canonical representations, intuitive decisions will be shaped by the factors that determine the accessibility of different features of the situation. Highly accessible features will influence decisions whereas features of low accessibility will be largely ignored – and the correlation between accessibility and reflective judgements of relevance in a state of complete information is not necessarily high (Kahneman, 2003a, p. 1459). In fact, at the first opportunity, the postulated homo oeconomicus did *not* strive for a maximisation of his utility, but opted for an allegedly safe alternative, instead. A particularly

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14 This study is commonly referred to as the *Asian disease study* in literature.

15 In the following subchapter, the previously mentioned *Prospect Theory* will confirm that people are not risk-neutral but can be risk-preferring when a decision is framed in terms of losses, and risk-averse when it is framed in terms of gains (Nooteboom, 2002, p. 81).

16 A consumer's distorted perception of risk appears as a consequence of his ignorance in an environment of uncertainty and the biased information he necessarily has to rely on, as illustrated in chapter 3.2.

unrealistic assumption of the rationality principle is that economic agents make their choices in a comprehensively inclusive context, which incorporates all the relevant details of the present situation, as well as expectations about all future opportunities and risks. Much evidence supports the contrasting claim that the agents' views of decisions and outcomes are normally characterised by *narrow framing* (Kahneman, 2003a, p. 1459).

Hence, an apparently inconsequential change in the formulation of a choice problem can provoke a significant change of preference. The reason for such an inconsistency is to be found in the interaction between variations in the framing of actions, outcomes, and conditional probabilities, and the characteristic nonlinearities of values in the consumer's decision function. Although these effects appear to be large and systematic, they are by no means universal. The observations do not imply that preference reversals or other errors of choice are necessarily *irrational*. In fact, they may even be justified regarding the effort required to explore alternative frames and to avoid potential inconsistencies.
Obviously, this substantiates the principle of bounded rationality and therefore has to be taken into account in any attempt to comprehensively analyse consumer behaviour under uncertainty.

3.3.3 Search Qualities, Experience Qualities, and Credence Qualities

Albeit their bounded rationality, consumers will continue the attempt to reduce their state of uncertainty (Hirshleifer and Riley, 1992, p. 299). As has been argued in the preceding sections and with consistent reference to the typology of Information Economics, this might be achieved through the acquisition of additional information about the future realisation of the states of nature. Interestingly, it was not before Nelson's (1970) seminal paper that the idea of a cost and benefit analysis of information was incorporated into the consideration of the consumer's process of decision making. Nelson's (1970) concept – which was later extended by Darby and Karni (1973) – is based on differentiating between goods according to their type of quality. Correspondingly, Nelson (1970, 1974) distinguishes between *search* and *experience qualities* of a good. Whereas search qualities are those that can be ascertained in the search process *prior* to purchase, experience qualities are those that can be discovered only *after* purchase as the product is used.[17] Darby and Karni (1973, p. 68) distinguish a third class of properties termed *credence qualities*. Credence qualities are those which, although

[17] Nelson (1970) suggests as an example of each the style of a dress and the taste of canned tuna, respectively.

worthwhile, cannot be evaluated in normal use. Instead, an assessment of their value requires additional, prohibitively costly information.

In the portrayed environment of a market that does not operate under perfect competition, consumers usually do not dispose of perfect information – neither about all prices of a good, nor about its *quality variations*. Yet, whereas the price as an evident characteristic of the good seems to be relatively easy to obtain and compare, circumstances regarding quality variations appear to be fundamentally different. Evidently, these limitations of consumer information about quality have profound effects on the market structure of consumer goods (Nelson, 1970, p. 311).

In analogy to the principle of bounded rationality and its classification of consumer decision making as a selective search process, the most obvious procedure available to the consumer in obtaining information about a good's characteristics is *search* (Nelson, 1970, p. 312). Interestingly, Nelson's (1970, 1974) understanding of search differs remarkably from Stigler's (1961, 1962) assumptions and is based on the premise that the consumer knows where to obtain the potential options prior to initiating the process of search.[18] Nelson (1970) approached the concept of search by assessing two limitations. First, the consumer has to investigate *all* options. Second, inspection has to occur *prior* to purchasing a product.

Accordingly, *search qualities* of a good consist of search attributes which are accessible for the consumer's inspection without restrictions of any kind. The attributes, procurable by means of information search, enable the consumer to obtain full information and to evaluate the product prior to purchase or use. As Wright and Lynch (1995, p. 709) note, 'for search attributes, consumers believe that before product use, they possess a subjectively reliable inferential rule that links an observable aspect of the product with a desired attribute, benefit, or outcome'. In consistency with the neoclassical principle, Nelson (1974) asserts that, in order to maximise the usefulness of their purchase decisions, consumers will search for information until the marginal costs of the search exceed the information's perceived marginal value.

For *experience qualities* of a good, any search for information on attributes is impossible or inappropriate prior to purchase. In contrast to search qualities, experience qualities are

[18] Rather than the more appropriate sequential decision analysis, Stigler's (1961, 1962) theory is a prior theory of search. In Stigler's model, the consumer must decide prior to searching how many searches he will undertake. Yet, any consumer can do better by searching until he finds a good that is better than some minimum level of utility (Nelson, 1970, p. 313).

dominated by attributes which a consumer can determine only through the good's consumption or use, i.e. after purchase (Nelson, 1970, p. 312). Since the consumer perceives a much less trustworthy link between the information available before use and that available after use for experience products, the experience quality of a product is based on individual sensory perception; i.e. experience attributes are differentiated according to the perspective of each consumer (Wright and Lynch, 1995, p. 711). Besides, the concept of experience qualities includes the impact of relative costs of obtaining information about the product's attributes on the consumer's process of decision making. Consumers might prefer information about a product's attributes by means of experience rather than by means of search if the relative costs of search for information exceed the costs of purchase. Adjusted to the above discussion of marginal costs and utility, any even moderately expensive search procedure would be excluded if the purchase price is low enough. Experience might be employed as the cheaper information procedure (Nelson, 1970, p. 312).

Finally, *credence qualities* of a good arise when the presence of a product's attribute cannot be evaluated in normal use. In contrast to both search and experience qualities of a good, the presence of credence attributes cannot be determined, although worthwhile, either before or after the product's consumption or use. Thus, the differentiation between experience and credence qualities of a good may not always be distinct, particularly if the quality attributes will be discerned in the course of time. At most, and reasonably unlikely, the presence of credence qualities of a good can be ascertained at prohibitively high expenses (Darby and Karni, 1973, p. 69). As a consequence, the consumer's only alternative is to rely on the attribute specific information the supplier provides.[19] Correspondingly, a plausible strategy of the consumer to reduce his individual uncertainty might be to incorporate the element of *trust* into his process of decision making.

Relating to the above typology, Nelson referred to *goods* in a first step before adjusting the approach in favour of goods' *characteristics* as illustrated in figure 3.7 (Nelson, 1970, p. 313; 1974, p. 732; Weiber and Adler, 1995, p. 59).

[19] Darby and Karni (1973, p. 69) assert the advantages of the removal of an appendix, which will be correct or not according to whether the organ is diseased, as an example for credence qualities of a good. The patient will have no different experience after the operation whether or not the organ was diseased. Alternatively, the reader might think of organic food as another illustrative example.

		point of time of attribute evaluation	
		before purchase	after purchase
possibility to evaluate attributes	possible	search quality	experience quality
	impossible	experience or credence quality	credence quality

Figure 3.7 The Characterisation of Search, Experience, and Credence Qualities
Source: Weiber and Adler, 1995, p. 59.

The transition towards a good's characteristics is more precise since most products can typically be characterised through all three types of qualities. Considering organic food, for example, its freshness can be judged prior to purchase (search quality), whilst its taste reveals itself during consumption (experience quality). Whether the food indeed is an organic food, however, is a credence quality. Thus, any product might combine individually weighted search, experience, and credence qualities. The assignment of a quality to a good's attribute – and hence its categorisation – occurs mostly subjectively (Kaas and Busch, 1996, p. 244).

As has been argued above, a plausible strategy of the consumer to reduce his individual uncertainty, particularly featuring credence qualities of a good, incorporates the element of trust. This issue can be illustrated against the background of *food safety*. Since food safety cannot be perfectly observed prior to consumption, it is generally considered an experience quality. Still, it comprehends a strong credence component since consumers generally have little alternatives but to confide in the supplier with respect to food safety. Regarding the credence quality, consumers usually cannot rely on personal experience for the evaluation of the supplier and thus require additional information (Böcker and Hanf, 2000, p. 474). This is further substantiated by Halk's (1992, p. 20) identification of trust as a necessary means to reduce uncertainty to acceptable levels and to simplify decisions. This type of behaviour is not necessarily *irrational* in the economic sense but even appears to be rational when considering the volume of information that would be necessary for fully informed choices (Nooteboom, 2002, p. 37).

3.3.4 The Element of Trust

Despite the wide-spread understanding of the increasing importance of behavioural elements like trust for an analysis of consumer behaviour, an embedding of the concept into economics is only little beyond its fledgling stages (Hosmer, 1995, p. 380). Trust and the conditions under which it might be considered as a market determinant have so far only been sketchily

discussed and applied incompletely to consumer behaviour under uncertainty (Misztal, 1998, p. 29).

Regardless of the renascent interest in a conceptualisation of the multifaceted element of trust in recent years, the prevailing methodological diversity mostly circumvents a distinct definition of trust.[20, 21] Yet, the perhaps most commonly used concept – particularly in the environment of economics – defines trusting behaviour as 'an underlying psychological condition comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of another whose behaviour is not under one's control in a situation where the losses one suffers if the other abuses that vulnerability exceed the benefits one gains if the other does not abuse that vulnerability' (Deutsch, 1962, p. 277).[22] Nooteboom (1996, p. 989) complements this definition by remarking that '*X* trusts *Y* to the extent that *X* chooses to cooperate with *Y* on the basis of a subjective probability that *Y* will choose not to employ opportunities for defection that *X* considers damaging, even if it is in the interest of *Y* to do so. The trustworthiness of *Y* depends on *Y*'s true propensity to employ those opportunities' (Nooteboom, 1996, p. 246). Resumptive, the concept of trust implies a disposition towards trusting behaviour; i.e. behaviour with limited safeguards, and accepting vulnerability based upon the personal expectation, i.e. the subjective *confidence* that this risk is limited.

One of the first elementary, unidimensional approaches to analyse trust in the perspective of a rational choice model of neoclassical economics has been presented by Coleman (1990, p. 99). His approach is based on the postulate of maximising utility under uncertainty and requires the *trustor* to decide between investing trust – which would yield an expected utility of the expected value of a potential gain less the expected value of a potential loss, and not investing trust – which would not change his utility. The decision whether or not to trust the *trustee* is based on the expression

$$p\,G > (1-p)\,L \text{ and} \tag{3.22}$$

$$p\,G - (1-p)\,L > 0\text{, i.e. } p = \frac{L}{(L+G)} \text{ or} \tag{3.23}$$

20 According to Luhmann (1979, p. 21) who understands the concept of trust as a special form of attitude, trust comprises *affective*, *cognitive* and *conative* components.

21 In accordance with Six's (2003, p. 198) conceptualisation of the element of trust, the latter can be divided into a *dispositional* and a *behavioural* dimension. Whereas the behavioural dimension focuses on trusting behaviour itself, the prevailing dispositional dimension focuses on the disposition to engage in trusting behaviour – as does this publication.

22 For reasons of clearness, the term *trusting behaviour* will be used for the behavioural aspect whereas *trust* will be understood as the *underlying disposition* in the following.

$$pG < (1-p)L, \text{ respectively,} \qquad (3.24)$$

with p as the probability that the trustee is trustworthy, G as the potential gain, and L as the potential loss that might occur if the trustee is not trustworthy.[23] Whereas in equation (3.22) and (3.23) trust is invested by the trustor, he refrains from trusting the trustee in equation (3.24) (Coleman, 1990, p. 99).

Even though it appears logically consistent to consider trust as a *subjective probability* in the above context, such step would raise several questions. Certainly, regarding trust as a subjective probability has the advantage that the relation between trust as an assessment of risk and the stakes involved in the form of possible utility and disutility could be demonstrated through a probability calculus. This notion of trust would imply a relatively high level of trust if the subjective probability of gains, pG, was high or the perceived risk of losses, $(1-p)L$, was low. Trust would be highest if the probability of gains were unity – so that there is neither vulnerability nor risk left. Yet, in this scenario of complete certainty, trust would simply be redundant. Any cooperation could be achieved by simply matching each other's resources. Apparently, this concept entails an information paradox. Trust entails both a lack of information – which yields uncertainty; and information – which limits the perceived risk. This suggests that there can neither be trust with a complete lack of information, nor with complete information since trust would then be tantamount to knowledge (Nooteboom, 2002, p. 39). A further reason to reject the notion of trust as a subjective probability is that it appears too strictly rational and calculative, and thereby excludes trust on possibly irrational convictions and particularly on repeated and routine behaviour (Nooteboom, 2002, p. 41).

Other than the mentioned element of risk whose existence is required for the *process* of trust to arise, the element of *interdependence* proves to be a second, necessary condition. The concept of interdependence implies that the interests of one party cannot be achieved without an at least partly *reliance* on another. Reliance, however, comprises the facet of *reciprocity* as an element of interdependence in a broader sense. Since the path-dependent connection between trust and risk-taking arises from a reciprocal relationship, this also accounts for trust. Whilst reliance upon the trustee and hence the trustor's *expectations* emphasise the *unilateral*

[23] It has been argued against Coleman (1990) that the expression which he suggests as underlying the potential trustor's behaviour pretends formalistic accuracy where there cannot be any, as the difficulty lies in the translation of circumstances specific to a situation into the values for insertion into his formula (Preisendörfer, 1995, p. 267).

aspect of vulnerability as a facet of trust, reciprocity is a *bilateral* phenomenon and thus comprises the trustee's behaviour.[24] Whenever there is a possibility for repeated interaction and reputation building, for example, those who have been trusted, might self-interestedly choose to reciprocate. Indeed, research on the development of trust suggests that a primary means of building trust is via repeated positive interactions over time, although trusting is not likely to engender universal reciprocity (Malhotra, 2004, p. 62). Furthermore, despite potential incentives to undertake opportunistic actions that might result in short-term benefits, the long-term lack of trust or even mistrust will inhibit future interactions. The reputation of a trustee as a result of trustworthy behaviour hence has an economic value since it plays a crucial role in determining the willingness of trustors to enter into a relationship with a given trustee (Hosmer, 1995, p. 386).

Interestingly, although both risk and interdependence are required for trust to emerge, variations in these factors over the course of a relationship between parties can alter the *level* and *form* trust takes, i.e. the nature of risk and trust changes as interdependence increases (Rousseau et al., 1998, p. 395).

Still, even provided that the conditions of risk and interdependence are fulfilled, trust will not emerge abruptly but develop gradually. In consideration of the above, trust hence is not a *static* but a *dynamic* concept. Correspondingly, literature traditionally distinguishes between different phases of trust. Whereas in the *building phase* trust is (re-)formed, it is already existent in the *stability phase* before it might lately decline in the *dissolution phase* (Rousseau et al., 1998, p. 396).[25]

Typically, social exchange relations evolve in a slow process, starting with minor transactions in which only relatively little trust is required because only little risk is involved. These minor transactions allow partners to prove their trustworthiness and furthermore enable them to expand their relation as a prerequisite for larger transactions (Shapiro, 1987, p. 625). In the absence of prior trust, the future trustor will obtain information and personal experience as a basis for inferring limits of trustworthiness and for setting tolerance levels of trust towards the future trustee in a first step. If this trust is not betrayed, thresholds will be passed and its tolerance levels might be widened on the basis of identification and empathy, based on the development of shared cognitive frames in cognitive-based trust, i.e. the reduction of

[24] Correspondingly, trust also comprises the facet of *predictability* of the trustee's behaviour to a lesser extent (Luhmann, 1979, p. 27).

[25] Literature occasionally emphasises that a *stage of control* might precede the building phase of trust (Nooteboom, 2002, p. 90). Since this is of only subordinate importance for this publication, it will not be further analysed.

cognitive distance, in a second step. This, however, does not necessarily have to occur when the partner's limits of trustworthiness lead to the inference that the relationship does not allow for trust. In this case, relevant thresholds would remain insuperable. That cognition would be the first step towards a transition into the dissolution phase in which trust usually collapses once a certain threshold is violated. A violation of a trustee's reliance, i.e. his trustworthiness, inevitably leads to a sense of disruption of trust, or profound confusion, but not yet necessarily to profound *distrust*. Distrust emerges once the suspicion arises that the disruption of expectations in one interaction is likely to extend itself due to an intentionality that continues throughout all interactions (Zucker, 1986, p. 59).

With respect to the eventually changing forms of trust, literature generally distinguishes between different typologies of trust; *deterrence-based* trust, *knowledge-based* or *calculative* trust, and *cognitive-based* or *relational* trust (Nooteboom, 2002, p. 90; Shapiro et al., 1992, p. 368).[26] Deterrence-based trust rests on a consideration of the incentives that the other party faces. If incentives are aligned, or if the other party does not gain from exploiting the vulnerability of the trustor, then trust increases. Calculative trust rests on a consideration of the intrinsic characteristics of the other party; if the other party is seen as being fair and having integrity, these attributions increase trust. Cognitive-based trust rests on a consideration of the relationship between the parties; to the extent that each party is seen as inherently caring about each other's welfare, then this perceived benevolence increases trust (Malhotra, 2004, p. 61).

In the following, it shall be assumed that at the beginning of a relationship, i.e. in the building phase, calculative trust is prevailing, whereas in the stability phase mostly cognitive-based trust prevails. Deterrence-based trust shall not be considered in the further analysis since its conceptualisation lapses with an increasing incentive to exploit the vulnerability since *reciprocity* is not guaranteed. This might be taken as an indication that trust tends to be a *hybrid* phenomenon between calculation and predictability on the one hand and voluntary exposure to vulnerability and expectations, on the other hand (Bachmann, 1998, p. 303).

In the above context, a necessary distinction between basing a decision upon a calculation and including calculative elements in the process of decision making needs to be emphasised.

[26] An analysis of trust necessarily needs to recognize the concept's two-sidedness which distinguishes trust, on the part of the trustor, and trustworthiness, on the part of the trustee. For trust, there are rational reasons and psychological causes. Reasons arise from a rational assessment of the trustee's trustworthiness, based on knowledge of him inferred from reputation, records, established norms and standards, or personal experience. Whereas rational trust is based on an attribution by the trustor of reasons for trustworthiness to the trustee, the principal psychological cause is empathy (Nooteboom, 2002, p. 8 and 12).

Neither would a trustor base his decision exclusively on a calculation which left no need for trust, nor would he naively engage in *blind trust*. Certainly, no trustor would completely ignore the available calculative considerations in order to reduce the risk of a deception. Still, the difference between pure calculation and trust is that the latter is constitutively based on a social form of rationality presupposing that the trustee is not merely to be taken as a passive object which is to be assessed as accurately as possible. Instead, the trustee is a social actor who is free to either comply with the trustor's expectation or to disappoint his assumptions. Hence, both the trustor and the trustee can be conceptualised as social actors with mutual expectations about each other's future behaviour who can change their behaviour with reference to what the other side expects them to do. In other words, when a trustor expects a potential trustee to behave trustworthily and the trustee himself can expect the trustor to make this expectation, then this might well contribute to the trustee's decision to behave trustworthily (Bachmann, 1998, p. 302).

Still, neither expectations nor a trustor's personal experience is an adequate or exclusive means to evaluate a trustee's trustworthiness, especially when considering the credence qualities of a good. In fact, the trustee's trustworthiness – and thus the amount of trust the trustor is willing to invest, is additionally reliant on information. Since trust appears as a dynamic concept – adjustments otherwise would not be feasible – any change in information will trigger a revision process regarding the trustee's perceived trustworthiness.[27] Such a revision process, which in fact is a learning process from the trustor's point of view, can be accurately portrayed through a *Bayesian Revision Process* (Böcker and Hanf, 2000, p. 475).[28]

3.3.5 An Adaptive Model of Trust in Decision Making

One of the first *multilevel* approaches to formally introduce the element of trust into the consumer's process of decision making under uncertainty was undertaken in Böcker and Hanf's (2000) model of individual information processing. The model, on which the following implications draw, proposes a two step risk perception process in which differences in the reliability between single types of suppliers are captured by subjective failure

[27] Focussing particularly on the credence qualities of a food on a single market, the consumer will in the following generally be regarded as the trustor whereas the supplier is the trustee – due to the heavily biased information in favour of the supplier.

[28] Arrows (1982, p. 1) refers to it as the 'Bayesian hypothesis for learning', i.e. the consistent use of conditional probabilities for changing beliefs on the basis of new information.

probabilities. In contrast to the above paragraphs, trust is understood as a subjective probability that the trustee, i.e. the supplier of a food, is reliable.

Assumingly, consumer *K* distinguishes between two different types of suppliers. Whereas suppliers of type *A* are regarded as reliable, those of type *B* are assumed to be less reliable. Consequently, *K* judges the probability $P(G|A)$ to purchase an unsafe item from type *A* to be smaller than $P(G|B)$, the respective failure probability assigned to type *B*. Referring to available information and personal experience, *K* generally purchases from supplier *J* which he presumes to be of type *A*. Since *K* does not possess perfect information, however, he cannot be sure that *J* actually belongs to type *A*. His trust in *J* to be reliable is expressed through the subjective probability P_J, leaving a residual probability of $(1-P_J)$ for *J* belonging to type *B*. Formally, the subjective probability of the event P_G to purchase an unsafe item from *J* is

$$P_G = P_J P(G|A) + (1-P_J) P(G|B). \tag{3.25}$$

Naturally, *K* can modify his decision to purchase a potentially unsafe item *X* with $X \in \{X^+, X^-\}$ anytime by replacing it through substitute *Y* which he considers to be more secure. The substitution, however, would require *K* to additionally determine U_X^+, which is the utility from a safe unit of *X*, U_X^-, which is the *dis*utility from an unsafe unit of *X* with $U_X^- < 0$ and U_Y, which is the utility from a unit of *Y* with $U_Y < U_X^+$. Note that both U_X^+ and U_Y are deterministic and defined as utilities net of price for reasons of simplicity. The consumer's preferences, which are assumed to be *cardinal*, can be defined as a *monotone increasing* and *concave* state-dependent *von Neumann-Morgenstern utility function*; $U(X^+, Y)$ if the safe state, and $U(X^-, Y)$, if the unsafe state occurs, respectively (Eom, 1994. p. 762). *K* will only purchase *X* if its expected utility exceeds that of substitute *Y*

$$(1-P_G) U_X^+ + P_G U_X^- > U_Y. \tag{3.26}$$[29]

[29] Although equation (3.26) differs from Böcker and Hanf's (2000, p. 476) conceptualisation, the conclusion remains practically unchanged.

In other words, *K*'s purchase decision can be described as

$$\pi\left[(1-P_G)U_X^+ + P_G U_X^-\right] + (1-\pi)U_Y \tag{3.27}$$

with π as a binary variable that takes the value one if the strict inequality (3.26) holds and zero, otherwise. Given the above assumptions, *K*'s purchase decision can be described as maximising the following expect utility subject to a budget constraint

$$\max_{U_X, U_Y} EU = \pi\left[(1-P_G)U_X^+ + P_G U_X^-\right] + (1-\pi)U_Y \tag{3.28}$$

subject to

$$y = p \cdot x\,. \tag{3.29}$$

Solving the constrained expected utility maximisation problem in equation (3.28) and (3.29) according to Eom (1994, p. 761) yields an expected value of state dependent indirect utility functions

$$EV(p, \pi, y) = \pi V_{X\in\{X^+, X^-\}}(y, p) + (1-\pi)V_Y(y, p)\,. \tag{3.30}$$

Replacing P_G with equation (3.25) and rearranging leads to

$$\frac{(1-P_G)U_X^+ - U_Y}{(-1)\,U_X^-} > P_G = P_J\, P(G|A) + (1-P_J)\,P(G|B), \text{ and} \tag{3.31}$$

$$\frac{U_X^+ - U_Y}{(-1)U_X^-} > P_J\, P(G|A) + (1-P_J)\,P(G|B), \tag{3.32}$$

respectively.[30] Note that both sides of inequality (3.32) are strictly greater than zero. Since the numerator on the left side is small and the denominator large, the entire ratio is positive, but small. Still, for *X* to be bought at all, the right hand side must be even smaller. The likelihood

[30] A detailed derivation is illustrated in appendix I.

for *K* to purchase *X* increases as either $P(G|A)$ or $P(G|B)$ decreases, and as P_J increases (Böcker and Hanf, 2000, p. 476). Correspondingly, relatively small failure probabilities, $P(G|A)$ and $P(G|B)$, increase the probability that *K* purchases *X* from *J*. Only when *K*'s confidence in *J* is *absolute*, i.e. equals one, the failure probability of the less reliable supplier looses its impact on *K*'s purchase decision which then exclusively depends on $P(G|A)$ to be small.

Following these introductory steps, Böcker and Hanf (2000) assume that *K* comes to know about the occurrence of a disconcerting incidence, caused by good *X* which *J* has sold.[31] As a consequence, *K* will revise any prior belief P_J about *J*'s reliability to the posterior probability P_{PJ} which is the conditional probability of '*J* being of type *A*' after having observed that *X* is unsafe

$$P_{PJ} = \frac{P_J \, P(G|A)}{P_J \, P(G|A) + (1 - P_J) P(G|B)}. \tag{3.33}$$

A comparison between *K*'s trust in *J* *before* and *after* receiving information about the incidence yields difference *D* with

$$D = P_J - P_{PJ}; \; D > 0 \; \forall \; P_i. \tag{3.34}$$

The fact that *D*'s value is *always* greater than zero substantiates the expected result of a *loss of trust* as a consequence of receiving negative information about a disconcerting (food safety) issue (Böcker and Hanf, 2000, p. 477).[32] Interestingly, the partial derivative of *D* with respect to $P(G|A)$ is negative, whereas it is positive with respect to $P(G|B)$. This opposite impact of the two subjective failure probabilities increases the loss of confidence as the *reliability ratio v* increases

$$v = \frac{P(G|B)}{P(G|A)} \text{ with } v > 1, \text{ as } P(G|A) < P(G|B). \tag{3.35}$$

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31 Precisely, Böcker and Hanf (2000, p. 476) presume that *J* has sold units of *X* that caused health problems or that *J* has violated health regulations.

32 Böcker and Hanf (2000, p. 481) provide formal proof for *D* always being greater than zero.

According to the above equation, both *v* and *K*'s prior level of trust determine the partial derivative of *D* with respect to P_J. Correspondingly, the extent of the loss in confidence and the value of P_J increase as *v* increases. As *v* approaches one, the perceived discrepancy in subjective failure probabilities between suppliers of type *A* and *B* decreases. This, as well as the prior confidence P_J being near one, provokes a relatively small loss of confidence following disconcerting information about an incidence. Obviously, these interdependencies create a dilemma for suppliers, who have to increase both P_J and *v* in an attempt to build up a high a priori reliability reputation. The dilemma arises, as information on the suppliers' level of reliability is ex ante incomplete. Any increase in P_J that does not come near one or a *v* too large will deflagrate without any effect and trigger a critical loss in confidence following a food safety incidence.

Following the consumer's loss in confidence, Böcker and Hanf (2000, p. 478) investigated the course of *regaining* it in a succeeding step. *K* is now assumed to revise his confidence in *J* on the basis of information about *X* being safe. The former *posterior* conditional probability P_{PJ} now enters into the Bayesian Revision Process as the *a priori* probability which finally leads to P_{PPJ}. The latter is understood as the conditional probability of '*J* being of type *A*' after having consecutively observed that *X* is unsafe and that *X* is safe

$$P_{PPJ} = \frac{P_{PJ}\left[1 - P(G|A)\right]}{P_{PJ}\left[1 - P(G|A)\right] + (1 - P_{PJ})\left[1 - P(G|B)\right]}. \tag{3.36}$$

According to the above equation, confidence is *always* regained, even if only partially, because P_{PPJ} is *always* greater than P_{PJ}.[33] The partial recovery of trust occurs under the condition that $P(G|A) + P(G|B) < 1$ since $P_J > P_{PPJ}$. Despite confining the general assumption $1 > P(G|B) > P(G|A) > 0$, the outcome of an only partial recovery is not unlikely when considering that $P(G|A)$ has to be small for *X* to be bought in the first place. Yet, if $P(G|A)$ is small, a violation of $P(G|A) + P(G|B) < 1$ would require $P(G|B)$ to be near one. Although this cannot be generally excluded, it has to be characterised as an untypical subjective judgement.

[33] Böcker and Hanf (2000, p. 482) provide formal proof for this assumption.

In analogy to equation (3.34), a comparison between *K*'s trust before and after receiving the information leads to difference *DD* which indicates the *remaining* loss in confidence, i.e. the difference between the original confidence and its value after two revisions

$$DD = P_J - P_{PPJ} \,. \tag{3.37}$$

Based on both differences *D* and *DD*, Böcker and Hanf (2000, p. 478) create a measure *R* for the effort that is necessary to regain the consumers' confidence

$$R = \frac{DD}{D} = 1 - \frac{P(G|A)P(G|B)}{P_J\,P(G|A)(1-P(G|A)) + (1-P_J)P(G|B)(1-P(G|B))} \,. \tag{3.38}$$

Presuming that $P(G|A) + P(G|B) < 1$ holds, values of *R* are constricted to the interval $[0,1]$. The closer *R* is to one, the greater the amount of positive information necessary for restoring the original level of consumer confidence P_J. Accordingly, the closer *R* is to zero, the smaller the necessary amount of information.

The partial derivation of *R* with respect to P_J yields a negative value which indicates that increasing levels of confidence prior to a food safety incidence generally prove helpful in an attempt to regain confidence. The impact on losses in confidence, however, is ambiguous. The partial derivations of *R* with respect to $P(G|A)$ and $P(G|B)$ also yield negative values. This illustrates yet another dilemma for the suppliers. Whereas $P(G|A)$ is generally desired to be small since that increases the purchase probability of *X*, particularly a small value of $P(G|A)$ increases the loss in confidence and makes it more difficult to restore after a food safety incidence.

The above paragraphs briefly outlined the concept of trust in economics, particularly within the context of consumer's decision making. Trust as a disposition to engage in trusting behaviour can be regarded as a multifaceted condition comprising both confident expectations and a willingness to be vulnerable as critical components (Rousseau et al., 1998, p. 394). Furthermore, risk and interdependence, especially reliance and reciprocity, were shown to be crucial elements of trust. A first comprehensive model (Böcker and Hanf, 2000) indicates that

high levels of trust are the most effective protection against an unanticipated loss of confidence following a disconcerting incidence.

The previous subchapters have illustrated that an analysis of decision making under uncertainty exclusively referring to the subjective Expected Utility Theory does not give consideration to the discrepancy between the consumers' *actual* and *optimal* choices as under the rationality principle. Furthermore, in certain situations, decision-makers were shown to systematically violate the basic tenets of the Expected Utility Theory. An approach to circumvent these violations and to present a more realistic model of choice is the Prospect Theory, which can be regarded as a precursor to the Theory of Planned Behaviour.

3.3.6 An Advancement – Prospect Theory

The Expected Utility Theory has dominated the analysis of decision making under uncertainty for several decades. It has been generally accepted as the prevailing normative model of choice and widely applied as a descriptive model of economic behaviour. However, Kahneman and Tversky's (1979) empirical evidence that decision-makers systematically infringe upon the principles of the Expected Utility Theory has raised serious questions. Meanwhile, there is nearly unanimous agreement that the theory does not provide an adequate description of individual choice. Among the many alternative models that have been proposed was the so-called *Prospect Theory*, a model of choice which explains the major violations of the Expected Utility Theory in choices between risky prospects with a small number of outcomes (Kahneman and Tversky, 1979; Tversky and Kahneman, 1986 and 1992).

In contrast to the Expected Utility Theory according to which choice is single-phased, Prospect Theory distinguishes two phases in the choice process; an early phase of *editing*, and a subsequent phase of *evaluation*. Whereas in the editing phase the offered prospects are preliminarily analysed, they are evaluated in the second phase. Finally, the prospect of highest value is chosen. The function of the editing phase is the organisation and reformulation of options in order to simplify the subsequent evaluation and choice. Editing consists of the application of several operations that transform the outcomes and probabilities associated with the offered prospects. Following the editing phase, the decision maker is assumed to evaluate each of the edited prospects, and to choose the prospect of highest value. The overall value of an edited prospect is expressed in terms of two scales, a *weighting function* π and a *value function v* (Kahneman and Tversky, 1979, p. 274).

The first scale, π , associates with each probability *p* a *decision weight* $\pi(p)$, which reflects the impact of *p* on the overall value of the prospect. The weighting function π is a monotonic function of *p* but not a probability measure and has the following properties

- Impossible events are discarded, i.e. $\pi(0)=0$, and the scale is normalised so that $\pi(1)=1$. Note that the function is not well behaved near the end points (Kahneman and Tversky, 1979, p. 283).
- For low probabilities, *subcertainty* can be observed, i.e. $\pi(p)>p$, but $\pi(p)+\pi(1-p)\leq 1$.Whereas low probabilities are overweighted, moderate and high probabilities are underweighted. The latter effect is more pronounced than the former.
- *Subproportionality* induces that for any fixed probability ratio *r*, the ratio of decision weights is closer to unity when the probabilities are low than when they are high, i.e. $\frac{\pi(pr)}{\pi(p)}<\frac{\pi(pqr)}{\pi(pq)} \forall\ 0<p,q,r\leq 1$.

The second scale, *v*, assigns to each outcome *x* a number $v(x)$, which reflects the subjective value of that outcome. These outcomes are defined *relative* to a reference point, which serves as the zero point of the value scale. Hence, *v* measures the value of deviations from that reference point, i.e. gains and losses. Accordingly, the difference in subjective value between a gain of 100 and a gain of 200 appears to be greater than the difference between a gain of 1,100 and a gain of 1,200. Similarly, the same relation between value differences holds for the corresponding losses. Thus, it can be hypothesised that the value function for changes of wealth is normally *concave* above the reference point ($v''(x)<0$ for $x>0$) and convex below it ($v''(x)>0$ for $x<0$). The marginal value of gains and losses generally decreases with their magnitude. Furthermore, *v* is assumed to be steeper for losses than for gains ($v'(x)<v'(-x)$ for $x\geq 0$). The first two conditions reflect the principle of *diminishing sensitivity* according to which the impact of a change diminishes with the distance from the reference point. The second condition is implied by the principle of *loss aversion* according to which losses loom larger than corresponding gains (Kahneman and Tversky, 1979, p. 278; Tversky and Kahneman, 1986, p. 258). A value function which satisfies the above properties is displayed in figure 3.8. Its course clearly displays the consumer's prevailing loss aversion and the associated distorted perception of risk.

The principle of diminishing sensitivity also applies to the weighting function π . In the evaluation of outcomes, the reference point serves as a boundary that distinguishes gains from losses. Transferring this to the evaluation of uncertainty, two natural boundaries that correspond to the endpoints of the certainty scale evolve; certainty and impossibility. The principle of diminishing sensitivity entails that the impact of a given change in probability diminishes with its distance from the boundary (Tversky and Kahneman, 1992, p. 303).

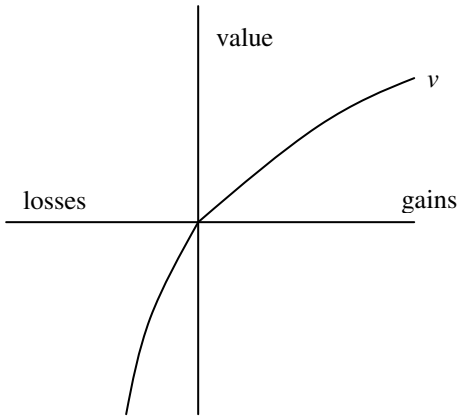

Figure 3.8 A Value Function
Source: Kahneman and Tversky, 1979, p. 279.

Although the present theory can be applied to derive the value function *v* from preferences between prospects, the actual scaling is considerably more complicated than in the Expected Utility Theory, because of the introduction of decision weights $\pi(p)$. Decision weights could produce risk-aversion and risk-preference even with a linear value function. Nevertheless, it is of interest that the main properties ascribed to the value function have been observed in an analysis of von Neumann-Morgenstern utility functions. Whereas most functions for gains were concave, they were convex for losses (Kahneman and Tversky, 1979, p. 280). A hypothetical weighting function that satisfies these properties is shown in figure 3.9.

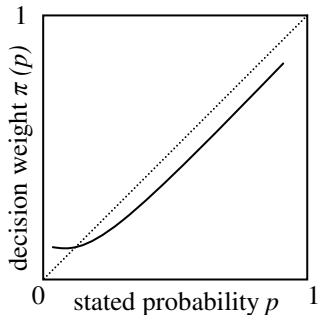

Figure 3.9 A Hypothetical Weighting Function
Source: Kahneman and Tversky, 1979, p. 283.

Resumptive, the key elements of the Prospect Theory are, first, a value function that is concave for gains, convex for losses, and steeper for losses than for gains, and, second, a nonlinear transformation of the probability scale, which overweights small probabilities and underweights moderate and high probabilities (Tversky and Kahneman, 1986, p. 275).

Whereas the axioms of the rationality principle underlying the subjective Expected Utility Theory are generally satisfied in *transparent* decision situations, they do not provide an adequate description of individual choice and even neglect the ubiquitous framing effects and the associated failures of invariance in the case of *intransparent* decisions. Prospect Theory, however, accommodates the observed violations of dominance and invariance. Its methodology, particularly the significance of framing, is largely consistent with the conception of the principle of bounded rationality as presented by Simon (1955). Hence, Prospect Theory is an important precursor of the Theory of Planned Behaviour which will be discussed in the following chapter.

3.3.7 Summary

Despite its general acceptance as the prevailing normative model of choice and its wide application as a descriptive model of economic behaviour, both the rationality principle and the subjective Expected Utility Theory have shown certain insufficiencies, particularly regarding intransparent decision situations. It is therefore self-evident to integrate the principle of bounded rationality into the analysis of decision making under uncertainty. As a consequence, the consumer will strive for satisficing instead of maximising his expected utility, considering the variable decision frame of his environment as under uncertainty.

Regardless of these changes, the consumer attempts to reduce his individual uncertainty through a strategy that involves the differentiation of goods – according to their type of quality – into search, experience, and credence qualities of a good. Whereas the search and experience qualities of a good can be ascertained either prior or after the purchase, credence qualities introduce the element of trust and hence trustworthiness into decision making. The impact of as well trust as information as market determinants following a disconcerting incidence are investigated in an adaptive model referring to a Bayesian Revision Process.

In a succeeding step, the Prospect Theory, which accommodates most of the afore mentioned insufficiencies and includes the conception of bounded rationality, is introduced as a theoretic foundation of the Theory of Planned Behaviour which will be illustrated in the following chapter.

3.4 A Conceptual Framework for Determining Consumer Behaviour

The previous subchapters have illustrated that the Expected Utility Theory, which has been accepted as the prevailing normative model of choice for a long time, does no longer provide an utterly adequate description of so complex a field as individual choice under uncertainty. The following section will discuss approaches that evolved as conceivable alternatives to the Expected Utility Theory. Among these are as well the previously mentioned *Prospect Theory* as the *Theory of Reasoned Action*, which are both considered as methodological precursors to the *Theory of Planned Behaviour*, on which this section will predominantly focus.

3.4.1 The Theory of Reasoned Action

Generally, common behaviour and thus most decisions a consumer is ever confronted with, is considered as *volitional behaviour* in the sense that any consumer can perform the behaviour in question provided that he is inclined to do so.[34] The Theory of Reasoned Action, as introduced by Fishbein and Ajzen (1975) and Ajzen and Fishbein (1980), aims at predicting the volitional behaviours and at comprehensively explaining their underlying psychological determinants. In doing so, the theory combines Fishbein's (1963) Attitude Theory and Dulany's (1967) Theory of Propositional Control which previously did not explicitly address social behaviour. Consequently, the Theory of Reasoned Action emphasises the impact of *behavioural* and *normative* beliefs on the consumer's intention to conduct a given behaviour (East, 1997, p. 134).[35]

Ceteris paribus, the Theory of Reasoned Action identifies the consumer's *intention* as the direct determinant of behaviour. Assuming that, in a first step, exclusively volitional beliefs determine the behaviour in question, intentions as an interposing feature can also be characterised as a volitional, i.e. conscious, and rational element in the process of decision making. Furthermore, since beliefs cannot turn into behaviour, intentions generally ought to be regarded as an indispensable factor within decision making.

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34 As an example Ajzen (1985, p.12) indicates that under normal conditions, consumers can, if they desire, choose to watch the evening news on television, vote for the candidate of their choice in an election, buy toothpaste at a drugstore, pray before going to bed, or donate blood to the Red Cross.

35 In contrast to the Multi Attribute Attitude-Theory, the Theory of Reasoned Action emphasises the attitudes towards *behaviours* and not towards objects, people, or institutions.

According to the Theory of Reasoned Action, intentions, which are understood as the *immediate antecedent* of behaviour, comprise two conceptually different determinants. Figure 3.10 depicts this in the form of a structural diagram. For ease of presentation, possible feedback effects of behaviour on the antecedent variables are not shown.

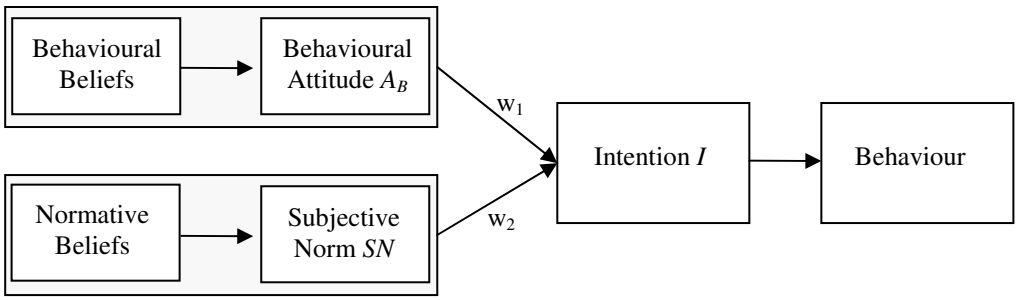

Figure 3.10 The Theory of Reasoned Action
Source: Ajzen and Fishbein, 1980, p. 13.

The first predictor of intention is the consumer's *attitude towards the behaviour*, A_B, which refers to the degree to which a consumer has an either favourable or unfavourable evaluation of the behaviour in question (Ajzen, 1991, p. 188). As in the Expectancy-Value Model of Attitudes, the consumer's attitude towards a behaviour is determined through his *salient* beliefs. These link the behaviour in question to positively or negatively valued outcomes.[36] The outcome's subjective value, in turn, contributes to the attitude in direct proportion to the strength of the belief, i.e. the subjective probability that the behaviour will lead to the outcome in question. Formally, this can be expressed as

$$A_B \propto \sum_{i=1}^{n} b_i^{sal} e_i \,. \qquad (3.39)^{37}$$

The strength of each salient belief b_i^{sal} is multiplied by the subjective evaluation, e_i, of the belief's attribute. The consumer's attitude towards the behaviour in question, A_B, is directly proportional to the sum of the resulting products across the *n* salient beliefs. As equation 3.39 indicates, a consumer who expects a behaviour to yield mostly positively valued outcomes will hold a favourable attitude towards performing it – and vice versa. The beliefs that

[36] For example, a person may believe that a change to a low sodium diet – which corresponds to a behaviour, reduces blood pressure, leads to a change in style, or severely restricts the range of approved foods. The latter are the corresponding outcomes directly connected to the consumer's behaviour (Ajzen, 1985, p.13).

[37] Related to the above notion is Edwards' (1954) *Subjective Expected Utility Theory* mentioned in chapter 3.1.

underlie the consumer's attitude towards the behaviour are generally referred to as *behavioural beliefs*.

The second predictor of intention is a social factor termed *subjective norm*, SN, and refers to the consumer's perception of contingent social pressures to perform the behaviour in question. Subjective norms are a function of *normative beliefs* that indicate the likelihood that important referent individuals or groups, i.e. the consumer's social environment, show an influence in his selection of behavioural patterns. The consumer will intend to perform a certain behaviour when he perceives it as being positively evaluated and as desired by the social environment – and vice versa. Still, the subjective norm is not determined through external social reinforcements but controlled internally in a significant manner (East, 1997, p. 135). Formally, the relationship between normative beliefs and the subjective norm can be expressed as

$$SN \propto \sum_{i=1}^{n} b_i^{norm} m_i \tag{3.40}$$

with b_i^{norm} as the consumer's *normative* belief concerning a social environment i, m_i as the motivation to comply with the expectations of the latter, and n as the number of salient normative beliefs. The strength of each normative belief b_i^{norm} is multiplied by the consumer's motivation to comply, m_i, with the corresponding social environment. The subjective norm is directly proportional to the sum of the resulting products across the n social environments (Ajzen, 1985, p. 14).[38]

The relative impact of the attitudinal and normative considerations on the intention to perform a certain behaviour depends on the consumer's personal traits and his embedding into the social environment and thus varies across consumers. This can be summarised as

$$B \sim I \propto \left(w_1 A_B + w_2 SN\right) \tag{3.41}$$

[38] As illustrated in the questionnaire attached in appendix III (questions 14 through 16 and 39 through 42), a global measure of SN is usually obtained by asking respondents to rate the extent to which "important others" would approve or disapprove of their performing a given behaviour.

with B as the behaviour of interest, I as the consumer's intention to perform behaviour B, A_B as the consumer's attitude towards performing behaviour B, SN as the consumer's subjective norm concerning the performance of behaviour B, and w_1 and w_2 as empirically determined weighting parameters that reflect the relative importance of A_B and SN (Ajzen, 1985, p. 13). Equation 3.41 illustrates that intentions are the immediate antecedents of the consumer's behaviour. Thus, behaviour is assumed to be determined through intentions.[39] Intentions, again, are directly proportional to the sum of weighed behavioural beliefs, i.e. the attitude towards the behaviour in question and weighed normative beliefs, i.e. the subjective norm. Behavioural and normative beliefs emphasise the consumer's beliefs about the consequences of performing the behaviour in question and the perception of contingent social pressures of the social environment. In other words, behaviour is explained by reference to the consumer's salient beliefs (Ajzen, 1985, p. 14).

According to the general assumptions of the Attitude Theory, beliefs represent an individual's available level of information. Thus, consumer behaviour is ultimately determined through information. Other, more distal factors such as personality traits, for example, influence a consumer's behavioural intentions – and thus his behaviour if, and only if they are related to the beliefs that underlie the behaviour's attitudinal or normative determinants, or if they influence the relative weights that are placed on these predictors (Ajzen and Fishbein, 1970, p. 468).[40]

Through its focus on intention, the Theory of Reasoned Action offers an elementary approach towards the development of consumer behaviour. Yet, intentions can influence the behaviour in question only if it is under the consumer's complete volitional control.[41] Although this might be the case for some behaviours, it realistically cannot apply to all and imposes strict limitations to the theory's range of application (Ajzen, 1985, p. 24). Its ability to predict and explain behaviour will be greatly impaired whenever *nonvolitional* factors, such as in an environment of an unanticipated external shock, for instance, exert a strong influence on the behaviour in question. In order to additionally consider behaviours over which consumers

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39 Empirical studies illustrate that consumers mostly act in accordance with their intentions (Ajzen, 1985, p. 17).

40 This uncompromising cognitivism was empirically tested by including external variables into a regression analysis to evaluate whether these significantly improve the prediction of intention compared to A_B and SN alone. As a matter of fact, external variables were found to have no effect (East, 1997, p. 136).

41 The original derivation of the Theory of Planned Behaviour (Ajzen, 1985, p. 12) defines intention and its other theoretical constructs in terms of *trying* to perform a given behaviour rather than in relation to actual performance. Following the strong correlations between measures of the model's variables that asked about trying to perform a given behaviour and measures that dealt with actual performance of the behaviour, the less cumbersome latter measures have been used in subsequent research (Ajzen, 1991, p. 182).

have an incomplete volitional control, the selection of factors which determine the consumer's intention needs to be complemented. This is described in the following section.

3.4.2 The Theory of Planned Behaviour

The Theory of Planned Behaviour is an extension to the Theory of Reasoned Action made necessary by the original model's limitations in dealing with behaviours over which individuals have an incomplete volitional control (Ajzen, 1991, p. 181). It has proven to be a widespread method that successfully analyses different behaviours, often associated with health-related issues.[42] Figure 3.11 depicts the theory in form of a structural diagram in which possible feedback effects of behaviour on the antecedent variables are not shown.

As figure 3.11 illustrates, the Theory of Planned Behaviour differs from the Theory of Reasoned Action in its addition of a third determinant of intention; the *perceived behavioural control*, *PBC*. The perceived behavioural control refers to the consumers' perceptions of their ability to perform a given behaviour. In analogy to the attitudinal beliefs, perceived behavioural control is determined by *control beliefs*, i.e. beliefs about the presence of factors that facilitate or impede the performance of the behaviour in question. Control beliefs are mostly determined through the consumer's individual experiences, but also through information and experience of the social environment that influences the subjectively perceived difficulty of performing the behaviour in question. The more resources and opportunities individuals assume to possess, and the fewer impediments they anticipate, the greater is their perceived control over the behaviour (Ajzen, 1991, p. 196). Accordingly, the consumer's perceived behavioural control varies across situations and actions.

[42] A search on the ISI Web of Science across all science, social science, and humanities journals indicates that 108 studies applied the Theory of Planned Behaviour over the last five years. An extensive list of applications of the Theory of Planned Behaviour is depicted in East (1997, p. 140) and Conner et al. (2003, p. 75).

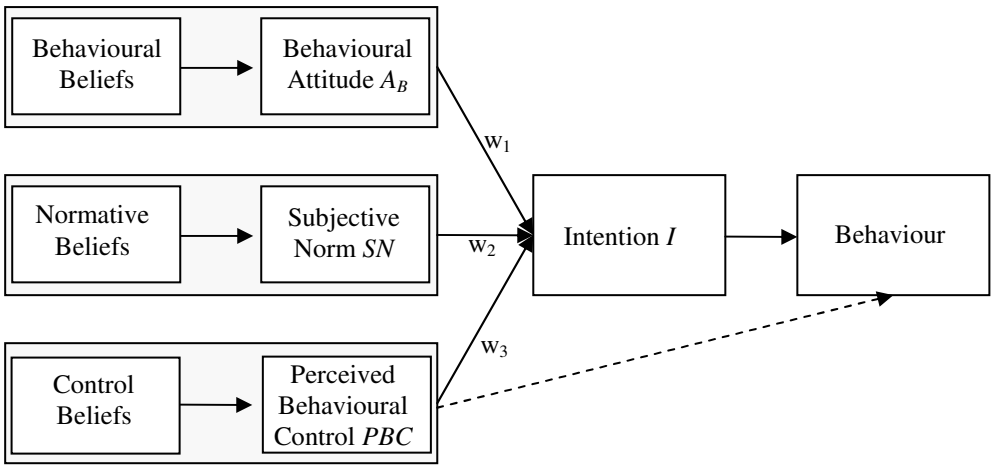


Figure 3.11 The Theory of Planned Behaviour
Source: Ajzen, 1991, p. 182.

Formally, the strength of each control belief, c_i, is multiplied by the perceived power, p_i, of the control factor. The perceived behavioural control is directly proportional to the sum of the resulting products across the *n* salient control beliefs,

$$PBC \propto \sum_{i=1}^{n} p_i c_i \,. \tag{3.42}$$

According to recent interpretations of the Theory of Planned Behaviour and denoted through the dashed line in figure 3.11, perceived behavioural control might also *directly* influence consumer behaviour (Ajzen, 1991, p. 184). This would imply a derogation of the intention's impact on consumer behaviour since the latter is at least partially determined through other antecedents. Prima facie, this assumption seems appropriate in an environment of certainty where a concentration on perceived behavioural control and behavioural intention might be sufficient to accurately predict consumer behaviour. On closer examination, however, the assumption appears to be reasonably misleading. The assumed direct link between perceived behavioural control and behaviour principally concerns repeated routine behaviours that, if any, involve only little cognitive and conscious reasoning. Therefore, the link is incompatible with consumer behaviour in the environment of uncertainty which inevitably focuses on intention as the immediate and exclusive antecedent of behaviour and will not be considered any further.

Consequently, intentions are directly proportional to the weighed sum of the behavioural, normative, and control beliefs. Formally, this can be expressed as

$$B \sim I \propto \left(w_1 A_B + w_2 SN + w_3 PBC\right) \tag{3.43}$$

with B as the behaviour of interest, I as the consumer's intention to perform behaviour B, A_B as the consumer's attitude towards performing behaviour B, SN as the consumer's subjective norm concerning the performance of behaviour B, PBC as the consumer's perceived behavioural control, and w_1, w_2, and w_3 as empirically determined weighting parameters reflecting the relative importance of behavioural attitude, A_B, subjective norm, SN, and perceived behavioural control, PBC.

According to the Theory of Planned Behaviour, intention, combining both volitional and nonvolitional determinants, is the immediate antecedent of behaviour and thus ultimately determines the consumer's actions. Since a high correlation is assumed to exist between the behavioural intention and actual behaviour, any prediction of intentions is a necessary as well as sufficient condition for the prediction of the consumer's behaviour (Ajzen, 1991, p. 203). Yet, intention is assumed to predict behaviour if and only if certain conditions are met. First, the consumer's intention cannot have changed prior to performing the behaviour of interest. Second, intention has to be directly proportional to the weighed sum of attitude towards the behaviour, the subjective norm and the perceived behavioural control, i.e. equation 3.43 must be satisfied (Ajzen, 1991, p. 185).[43]

Even if these conditions are met, a multitude of unanticipated, external events might influence the stability of the intention-behaviour relation. Among these, for example, is the impact of additional information on the consumer. Both his volitional, i.e. behavioural and normative beliefs, and his nonvolitional, i.e. control beliefs are subject to change as events unfold and new information becomes available. Such changes may influence the attitude towards the behaviour in question or his subjective norm and his perceived behavioural control, and, as a result, produce a revised intention (Ajzen, 1985, p. 19). Under these circumstances, an accurate prediction of behaviour is hardly feasible without the inclusion of additional predictors into the Theory of Planned Behaviour. This, however, only appears advisable if they capture a significant proposition of the variance in intention or behaviour *after* the theory's current variables have been taken into account.

[43] According to Ajzen and Fishbein (1977, p. 890), the Theory of Reasoned Action also requires that intention and behaviour are defined operationally so that they correspond in their target, action, context, and time (TACT) elements.

With reference to the previously discussed determinants of consumer behaviour under uncertainty, the Theory of Planned Behaviour will, in a first step, be extended towards the inclusion of *trust*, T, as an additional predictor of consumer behaviour. Trust was shown to be a crucial prerequisite for consumers to engage in economic interactions under uncertainty when the obtainment of complete information can only be ascertained at prohibitively high costs. This applies particularly for the credence qualities of a good (Darby and Karni, 1973, p. 69). Since trust under certainty, however, is tantamount to *knowledge*, any extension of the theory needs to include the element of *risk*, likewise. Yet, simply introducing risk into the analysis does not seem to be appropriate since the theory is predominantly concerned with the consumer's perception and beliefs. Consequently, emphasis will be put on the consumer's *perceived risk*, PR. This conceivable revision of the Theory of Planned Behaviour is depicted in figure 3.12.

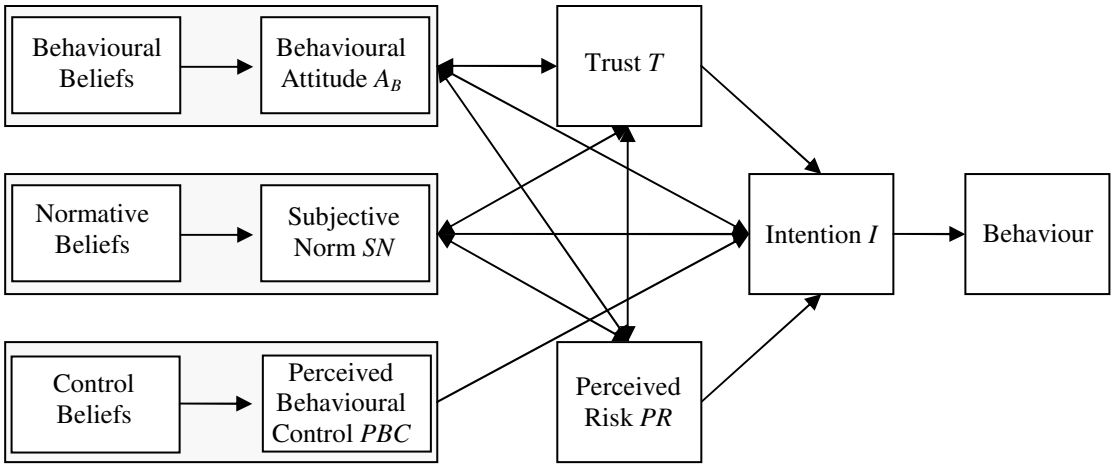


Figure 3.12 The Theory of Planned Behaviour – Revised

Despite the direct influence behavioural and normative beliefs exert on the consumer's intention, trust and perceived risk are introduced into the revised theory as mediating devices between the volitional beliefs and the intention to perform a given behaviour. Both factors depend on reciprocal ascendancies from the attitude towards the behaviour in question, A_B, and the subjective norm, SN. The consumer's nonvolitional beliefs, i.e. his perceived behavioural control, PBC, remain disregarded so far.

Generally, trust as an antecedent of intention refers to the trustor's subjective evaluation that his vulnerability, which is mostly due to incomplete information under uncertainty, will not be abused by the trustee (Nooteboom, 2002, p. 41. This subjective evaluation is largely congruent with the risk the consumer perceives. Despite these semantic similarities, trust and

perceived risk are inversely related in their impact on the consumer's intention to perform a given behaviour. Whilst a high level of perceived risk is generally reflected in relatively little trust which, in turn, impedes the conduct in question, a low level of perceived risk usually does not require trust as a premise for intention. Hence, the fragile state of likewise high levels of perceived risk and trust seems to be of particular interest due to its significant impact on the intention-behaviour relation. This situation will be thoroughly investigated in the subsequent chapters.

In contrast to the previously introduced determinants, neither trust, T, nor perceived risk, PR, follow an expectancy-value formulation. They therefore need to be derived as the weighed average of the specific trust and perceived risk components. Formally, trust can be denoted as

$$T = \sum_{i=1}^{n} \alpha_i t_i \,, \tag{3.44}$$

whereas the perceived risk is analogously represented through

$$PR = \sum_{i=1}^{n} \beta_i r_i \tag{3.45}$$

with t_i and r_i as the specific trust and risk determinants, respectively, and α_i and β_i as their corresponding weights. Considering the multitude of endogenous relations within figure 3.12, the revised theory can be subsumed to the following generic system of simultaneous equations

$$\left.\begin{aligned} I_B &= f\left(A_B, SN, PBC, T, PR\right) \\ T &= f\left(A_B, SN, PR\right) \\ PR &= f\left(A_B, SN, T\right) \\ SN &= f\left(T, PR\right) \\ A_B &= f\left(T, PR\right) \end{aligned}\right\} \tag{3.46}$$

in which the perceived behavioural control, PBC, is assumed to be the only exogenous variable. Contingently, the system depicted in the above equation might be improved by considering measures of *habit* and *experience*. These additional elements would enter into the consumer's formation of attitude, the risk perceived or the individual level of trust and could thus influence the intention-behaviour relation.

As illustrated in figure 3.12, the introduction of trust and perceived risk into the Theory of Planned Behaviour has not affected the consumer's nonvolitional beliefs, i.e. the perceived behavioural control and its direct influence on the consumer's intention to perform a given behaviour. Yet, the system in equation 3.46 is expected to model the *average* relation among the *global* variables and the behavioural intention and ought to assess whether these relations vary according to other factors. In consideration of the fact that particularly information and socio-demographic variables, i.e. the consumer's personality traits, demographic characteristics, or his attitude towards risk, for instance, ultimately determine the consumer's (volitional) beliefs, another extension of the original theory in order to comprehensively explain consumer behaviour under uncertainty seems inevitable. The extended Theory of Planned Behaviour is illustrated in figure 3.13.

Despite the unquestioned influence of as well socio-demographic variables as information, the effort to objectively attribute their impact to the respective beliefs appears to be inexpedient for the time being and moreover is not subject of this research. It is therefore assumed that these factors *generally* have an either positive or negative influence on the relation between beliefs, the mediating devices, and the consumer's intention to perform a given behaviour (Mazzocchi et al., 2004, p. 3). Whilst the consumer's volitional beliefs prove to be relatively easily alterable, this does not apply for nonvolitional beliefs. The minor extent of their interference is based upon predominantly cognitive and conscious choices and actions in the process of decision making under uncertainty that involve beliefs about the presence of factors that facilitate or impede the performance of the behaviour in question to a lesser degree. Thus, the perceived behavioural control as an antecedent of the consumer's intention will in the following be regarded as an exogenous variable exclusively (Mazzocchi et al., 2004, p. 4).

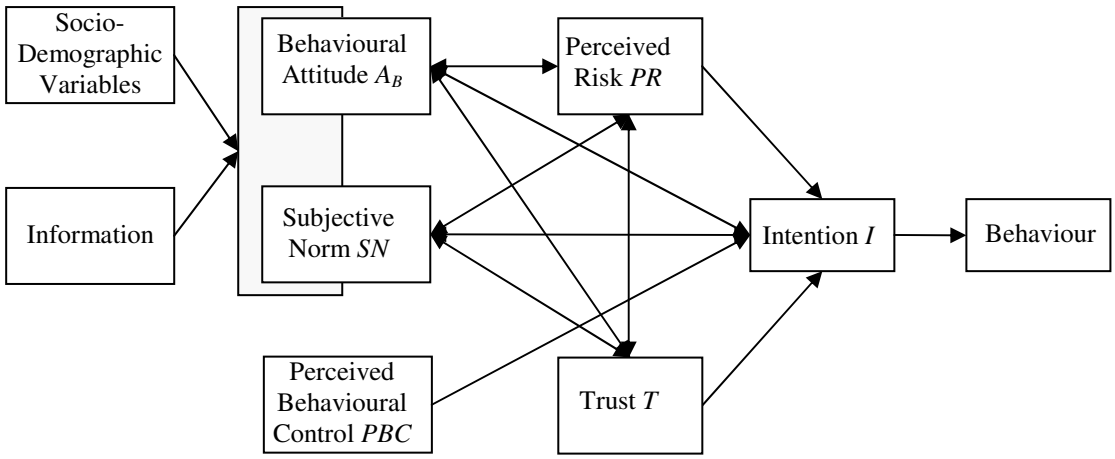


Figure 3.13 The Theory of Planned Behaviour – Extended

Decision making under uncertainty is characterised through cognitive and conscious (volitional) choices. These, however, do not only involve extensive and complex behaviours, but also feature habitual behaviours as antecedents of the consumer's intention to perform a given behaviour. A fundamental typology of decision behaviour under uncertainty is illustrated in the following paragraphs.

3.4.3 A Typology of Decision Behaviour

Naturally, the character of decisions is not globally alike but varies according to the situation's requirements and the consumer's underlying behaviour. In the prominent case of *purchase decisions*, this has led to a partition considering the consumer's level of cognitive control and the incorporated amount of information.

According to Katona (1951, p. 49), purchase decisions can be divided into *genuine decisions* and *habitual behaviour*. Genuine decision making, also termed *extended problem solving*, is characterised through the consumer's perception of an entirely *new* situation which is assumed to require a new form of response in order to solve a problem raised by it. These decisions occur only occasionally and are not entirely congruent with the notion of rational behaviour (Katona, 1960, p. 140). Habitual behaviour, in contrast, is rather common and refers to routine behaviour, i.e. the consumer reacts as before in a similar situation. Only little conscious reasoning is required for this type of behaviour which does not correspond to decision making in the strict sense (Katona, 1951, p. 49).

The above dichotomy, however, does not consider other than *extremes*. Therefore, Howard and Sheth (1969, p. 22) introduced the notion of *limited problem solving* and Weinberg (1980, p. 13) the idea of *impulse decisions* into the analysis. Limited problem solving refers to

decisions that involve a lower degree of complexity than extensive problem solving. Decisions are mostly based on experience from previous, comparable purchases, i.e. the consumer relies on predetermined decision criteria (Engel et al., 1993, p. 43). Impulse decisions, finally, are characterised through unplanned behaviour that is facilitated through emotional stimuli and little conscious reasoning (Weinberg, 1980, p. 14). A basic typology of purchase decisions with their corresponding level of cognitive control is depicted in figure 3.14.

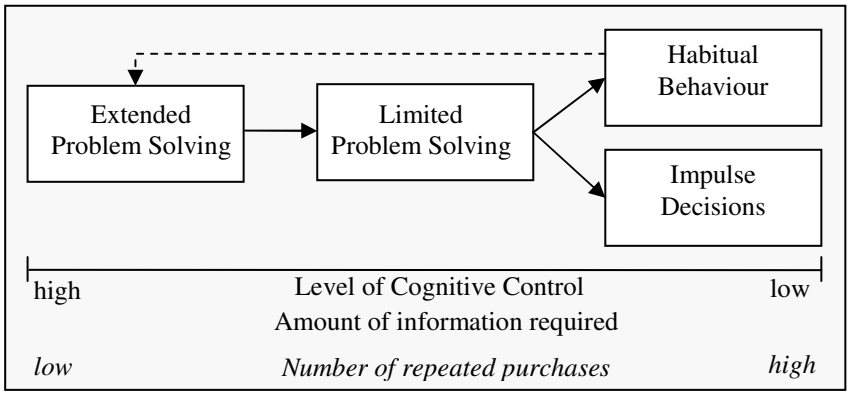


Figure 3.14 Purchase Decisions, their Transformation, and Cognitive Control
Source: Modified from Kuß and Tomczak, 2000, pp. 95-97.

Usually, extended problem solving comprises the consumer's response to an entirely new situation. Since these situations arise only sporadically, the consumer cannot dispose of predetermined decision criteria but necessarily requires a multitude of information for his decision. If, in contrast, he was confronted with a comparable situation every once a while, he could refer to previous experience and rely on specified decision rules. Evidently, the amount of information required for this limited problem solving is less compared to genuine decisions. Once certain purchase decisions occur regularly, such as on a daily or weekly basis, for example, virtually no other information than a set of predetermined decision criteria is required for the consumer's decision (Engel et al., 1993, p. 43).

Taking into account the previously addressed food safety incidences, i.e. random external shocks, not all types of purchase decisions seem to be equally suited to elucidate consumer behaviour. Certainly, in a common environment with everyday occurrences, decisions concerning the selection and purchase of food can mostly be assigned to limited problem solving or habitual behaviour. In highly intransparent situations in which wrong decisions might menace the consumer's state of health, however, formerly habitual decisions might

abruptly turn into genuine decisions as illustrated through the dashed line in figure 3.14. Generally, an adjustment towards increasingly sensible and conscious purchase decisions can be expected if uncertainty and perceived risk on a market increase. Thus, although the above typology appears suitable to briefly outline the character of purchase decisions, emphasis will in the following be put on genuine decisions, i.e. extended problem solving in the environment of a food safety incidence in the context of the Theory of Planned Behaviour. This step seems appropriate insofar as particularly extended problem solving might be subject to influence from the consumer's social environment – despite the consumer's necessarily high level of cognitive control. In addition to socio-demographic factors, attitudes, emotions, and expectations might influence the process of decision making; both by creating awareness for the problem and by specifying possible responses. Correspondingly, any investigation of consumer behaviour realistically needs to consider the consumer's embedding in his social network (Engel et al., 1993, p. 44).

Even though the Theory of Planned Behaviour as presented above will henceforth constitute the conceptual framework of this investigation, the former's weak points and possible restraints will not be concealed.

3.4.4 A Critical Assessment

Among the alleged objections to the conceptual framework of the Theory of Planned Behaviour the most notable is the trichotomy of beliefs. The necessity of the explicit distinction between behavioural, normative, and control beliefs and accordingly between the related constructs of attitude, subjective norm, and perceived behavioural control has been questioned. Since all beliefs associate the behaviour of interest with an attribute, Miniard and Cohen (1981, p. 315) proposed to integrate all beliefs about a given behaviour under a single summation in order to obtain a measure of the *overall* behavioural disposition. Despite its methodological attractiveness, the primary objection to this approach is that it blurs the distinction between the different facets of intention and thus an in-depth analysis. The personal evaluation of a behaviour (attitude), the socially expected mode of conduct (subjective norm), and the self efficacy with respect to the behaviour (perceived behavioural control) are different concepts which were shown to stand in different predictable relations to intentions and behaviour. Correspondingly, any mergence of these factors would result in a loss of explanatory power and will therefore – in contrast to the following remarks – not be considered any further.

Regarding the Theory of Planned Behaviour, intention is categorically regarded as the exclusive and immediate antecedent of behaviour. Even though not explicitly elucidated so far, this assumption entails that the consumer's intention to conduct a given behaviour does in fact coincide with the behaviour in question, i.e. even if the consumer merely intends to purchase a food, the purchase will be realised albeit external circumstances. Evidently, and not only in the environment of a food safety incidence, this assumption might prove to be misleading. Intentions are assumed to capture motivational determinants of behaviour and thus indicate the effort which a consumer plans to exert in order to perform the behaviour in question. Consequently, intentions can only be expected to predict the consumer's *attempt* to perform a given behaviour, but not necessarily its actual *realisation*, since the transition from intentions to actual behaviour can be impeded by a multitude of unanticipated, external incidents. As Ajzen (1985, p. 21) postulates, the likelihood concerning the realisation of a given behaviour increases with the consumer's intention to engage in the former. If this intention is sufficiently strong, changes induced through unanticipated events, or information which is perceived as being either irrelevant or not reliable will often be insufficient to reverse the planned course of action. Regarding weak intentions, in contrast, even incidents of minor importance might provoke a severe impact on the intention-behaviour relation.

Thus, the relationship between beliefs, attitudes, subjective norms and their influence on the consumer's intention appears to be more clearly delineated than are the factors that determine whether or not the behavioural intention will result in the behaviour in question (Ajzen, 1991, p. 199).

3.4.5 A Microeconomic Enhancement – The Element of Price

Despite the coherent rationale regarding the theoretical principles and advancements of the Theory of Planned Behaviour, classical microeconomic determinants such as the *price* of a commodity, for instance, have so far not been explicitly considered. This alleged inadequacy might raise questions concerning the universal applicability of the approach and possible restraints to its explanatory power. Therefore, the following subchapter will briefly discuss an enhancement of the Theory of Planned Behaviour through the neoclassical economic theory emphasising financial elements as determinants of consumer behaviour. The following paragraphs will predominantly focus on the element of price, p, as a determinant of the consumer's intention to conduct a particular behaviour, I.

Enhancing the revised Theory of Planned Behaviour as depicted in figure 3.15 by means of introducing the element of price requires a differentiated course of action since the price as an additional determinant can be assumed to affect the consumer's intention to conduct a particular behaviour both in an *indirect* and a *direct* manner. This is depicted in figure 3.15 through dashed lines.

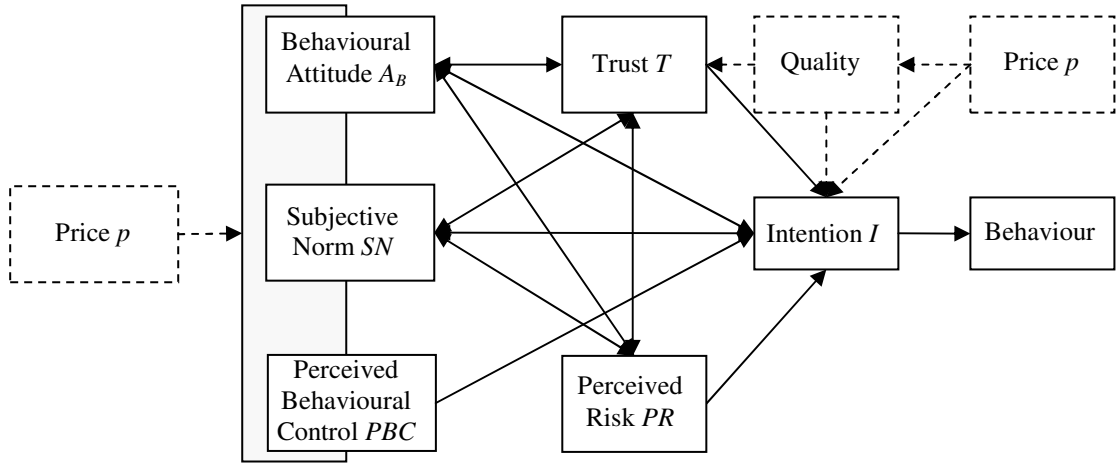


Figure 3.15 The Element of Price and its Introduction into the Theory of Planned Behaviour

As illustrated above, the price of a commodity is at first assumed to influence the classical determinants of intention, which, according to the Theory of Planned Behaviour, comprise behavioural attitude, A_B, subjective norm, SN, and perceived behavioural control, PBC (Ajzen, 1991, p. 188). In a second step, the impact of price on these parameters might exert an influence on the consumer's intention to conduct a particular behaviour. Surprisingly, however, no conceptually valid connexion between the consumer's attitude towards a behaviour, A_B, as denoted in equation 3.39, and the price of a commodity can be established. Evidently, a possible interrelation between the attitude towards a particular behaviour and the characteristics of an optional product cannot be combined in a meaningful manner. This also holds true for the attempt to establish a conceptually valid connexion between the subjective norm, SN, as denoted in equation 3.40, and the price of a commodity. The consumer's perception of contingent social pressures to perform a particular behaviour cannot be accommodated with the price of a commodity in any reasonable manner. Thus, an impact of price on the consumer's behavioural attitude and the subjective norm cannot be justified within the context of the Theory of Planned Behaviour. The impact of price on the consumer's perceived behavioural control as depicted in equation 3.42, in contrast, appears to be less controversial. In accordance with neoclassical microeconomic principles, the

consumer's perception of his ability to perform a given behaviour depends on his budgetary restraint – which varies according to the change in price of a commodity. Obviously, any change in his budgetary constraints exerts an influence on his perception of the ability to perform a particular behaviour.

The indirect impact of price on the consumer's intention to conduct a particular behaviour also needs to be observed when taking into consideration that the price is often regarded as an indicator for the *quality* of a commodity as depicted in figure 3.15.[44] Even though this price-quality relationship appears to be intuitively feasible, corresponding inferences are inappropriate (Hjorth-Anderson, 1984, p. 714; Tellis and Wernerfelt, 1987, p. 249; Hanf and Wersebe, 1994, p. 343).[45] A distinct coherence between price and quality of a commodity cannot be accepted as assured and will consequently not be implemented into the Theory of Planned Behaviour. Moreover, quality as a discrete parameter of both the consumer's trust, T, and his intention to perform a particular behaviour will not be explicitly regarded following the above rationale.

According to figure 3.15, price, however, is also assumed to affect the consumer's intention to conduct a particular behaviour directly. Basically, the interaction between price and the consumer's intention to purchase a specific product, i.e. his demand, is exhaustively specified in microeconomic theory (East, 1997, p. 82). Ceteris paribus, a reduction in the price of a good will result in an increase in its demanded quantity.[46] This *price effect* can be subdivided into a *substitution effect* and an *income effect* (Mas-Colell et al., 1995, p. 25). The substitution effect refers to the additional demand for good *A* which results from its relative decline in price. The consumer thereby substitutes good *B* which has experienced a relative increase in price. The income effect, however, refers to a relaxation in the consumer's budgetary restraint since the price of good *A* has decreased in absolute terms. This corresponds to an increase in real income which might provoke a change in demand. In the case of poultry, for example, which was shown to be a normal good (Wildner and von Cramon-Taubadel, 2003, p. 117), the

[44] According to Diller (1977, p. 227; 1988, p. 199), the production of premium products is more expensive than the production of standard products. Therefore, the price could be assumed to be an indicator for a commodity's quality.

[45] The studies cited denote that the statistically significant mean correlation between a product's price and its quality amounts to only 0.27 (Hjorth-Andersen, 1984, p. 714; Tellis and Wernerfelt, 1987, p. 249).

[46] Naturally, this does not hold true for *inferior* or *Giffen* goods (Varian, 1999, p. 137).

income effect can be assumed to reinforce the substitution effect (Varian, 1999, p. 143).[47] Still, even though the hypothesised decline in demand for a commodity involved in a food safety incidence suggests a sustainable adjustment of price, empirical data representing the poultry market surprisingly alludes to different findings (ZMP, 2004, p. 160).[48] Wildner (2001, p. 26), who analyses related studies, ascertains that *income elasticities* of demand for comestibles range from 0.25 to 0.60 – which clearly indicates an income-inelastic demand. Furthermore, a contamination of poultry with avian plague, salmonellae, dioxins or antibiotics such as nitrofurane or tetracycline is not reflected in the products' price level which remains mostly stable in the time lapse (ZMP, 2003, p. 161). In fact, prices appear to permanently remain within a certain band width which suggests that the price effect is not applicable in this context.

These findings, however, appear to be only partly endorsed through divers studies investigating both the Marshallian and Hicksian *price elasticities* of consumers' demand for poultry. With regard to the study conducted by Wildner (2001, p. 116), Marshallian price elasticities of consumers' demand for poultry are all together negative and range from -0.64 to -1.14 depending on the type of household examined. This also holds true for Hicksian price elasticities which lie between -0.59 and -1.10 (Wildner, 2001, p. 120). Mostly, however, the uncompensated and compensated price elasticities are statistically insignificant (Rickertsen and von Cramon-Taubadel, 2003, p. 45) and their absolute value declines in the course of time.[49] Thus, since consumers' demand for poultry according to the above figures apparently is approximately inelastic, the element of price will in the following not be explicitly taken into consideration in the course of this publication.

Resumptive, it needs to be remarked that the introduction of the element of price into the Theory of Planned Behaviour remains of questionable advantage since the methodology of the underlying principles is different. Whilst classical microeconomic concepts such as the Expected Utility Theory are *normative* concepts which are based on the assumption of consumers that boundedly rationally maximise their utility, the Theory of Planned Behaviour follows a *positive* approach and exclusively relies on behavioural determinants as precursors

47 Should the good be inferior, however, the income effect will reduce the substitution effect. In case of a Giffen good, the income effect is opposite and exceeds the substitution effect, i.e. despite an increase in price, demand will also increase. Whilst the substitution effect thus always is negative, the income effect can either be negative, neutral, or positive (Mas-Colell et al., 1995, p. 27).

48 Even though this statement naturally does not hold true for the BSE incidences on the beef market, for instance, it appears to be well suited for exemplifying purposes in the above context.

49 In contrast to the above, Henning and Michalek (1992, p. 342) determine an increase both in Marshallian and Hicksian price elasticities in the period from 1970 to 1985.

to the consumers' intention. Particularly with regard to this methodological incompatibility and the aspired high level of clarity of the explanatory approach, it will in the following be refrained from formally implementing the impact of price on the consumer's process of decision making under uncertainty. Even though an enhancement of the factors that finally determine the consumer's intention to conduct a particular behaviour – according to the Theory of Planned Behaviour – with an element as crucial to the consumer's process of decision making as price appears to be desirable in principle, this step remains subject to future research.

3.4.6 Summary

In its original representation, the Theory of Planned Behaviour postulates three conceptually independent determinants of intention. These eventual predictors of behaviour comprehend the consumer's attitude towards the behaviour which depicts the consumer's evaluation of the behaviour in question, the subjective norm which refers to the perceived social pressure to perform the given behaviour, and the perceived behavioural control which features the perceived facility of performing the behaviour.

Since the Theory of Planned Behaviour does not include other than volitional and nonvolitional beliefs as antecedents of the consumer's intention, the conducted extension additionally encompasses trust and perceived risk as mediating devices between the consumer's beliefs and his intention. Furthermore, information and socio-demographic variables were introduced as determinants of beliefs. Still, whether the accomplishment of the above measures proves appropriate in order to establish a conceptual framework for consumer behaviour in the environment of uncertainty and random shocks will become apparent in the empirical section of this publication.

4 An Empirical Evaluation of Trust and Consumer Behaviour

The previous chapters have systematically established a conceptual framework in order to thoroughly elucidate consumer behaviour under uncertainty. In response to obvious deficiencies that are inherent in the presented approaches, emphasis has been put on enhancements towards advanced considerations of behaviour subject to random external shocks. With regard to the increasing importance of such elements as attitude and information, particularly Behavioural and Information Economics have offered promising concepts whose combination accentuated the need for other than neoclassical microeconomic factors. Among other emerging factors of influence has been the notion of trust the significance of which will be determined in the following empirical review.

4.1 The Object of Investigation and its Conceptual History of Origins

The imperative of gradually enhancing existing approaches to comprehensively illustrate consumer behaviour under uncertainty is mainly caused by the non-observance of potentially relevant aspects. Prima facie, a concentration on factors of evident significance appears to be consistent with an attempt to depict a simplified, yet realistic image of the consumer's process of decision making. At closer inspection, however, such modus operandi impedes an investigation of other than the examined variables and thus cannot reveal their meaning. Consequently, as no scientific paradigm taken alone can provide a comprehensive explanation of so complex a field as consumer behaviour, it does not seem appropriate to persist in the academic dominance of the Subjective Expected Utility Theory but to pursue multifaceted approaches such as Behavioural and Information Economics. These approaches explicitly consider the coherence between attitudes and information and their ambiguous impact on behaviour. Furthermore, the self-evident combination of these concepts provides a sound foundation for introducing the element of trust which emerges as a strategy to reduce subjective uncertainty in an environment of incomplete information into the analysis.

Since the originally designated framework, the Theory of Reasoned Action, would restrain consumers' beliefs to volitional behaviours exclusively, trust was instead integrated into the Theory of Planned Behaviour which additionally considers consumers' nonvolitional behaviours. In accordance with the conceptual structure of this approach, trust was introduced as a mediating device between the consumer's beliefs and his intention to conduct a given behaviour. Additionally, information and socio-demographic variables were included as antecedents of the consumer's volitional beliefs as depicted in figure 3.12. Assuming a state of incomplete information which appears manifest in the environment of a food safety

incident, trust as a precursor to intention is inevitably associated with the risk the consumer perceives on the respective market. For the purpose of including such circum-stances, perceived risk was parallelly introduced as a mediating device between beliefs and intention. Furthermore, it was presumed that consumers exercise particular caution when being confronted with purchase decisions under eminent uncertainty. Under such circumstances, habitual behaviour can no longer be sustained and will be replaced through extended problem solving which is based upon high levels of cognitive control and accessible information. Purchase decisions in the event of a food safety incident are hence assumed to occur in a conscious and well considered manner in order to minimise the potential threat to the consumer's state of health.

The conceptual history of origins of trust as a determinant of consumer behaviour under uncertainty has resulted in a stepwise extension of Ajzen's (1985) Theory of Planned Behaviour. This measure aims at proposing a behavioural model for explaining the influence of different levels of trust and risk perception on purchasing intentions. Despite the previous theoretical considerations, the actual significance of these variables has not yet been evaluated empirically. Following a brief outline of the survey and its respective data, an analysis of the implemented refinements will be the main focus of the succeeding subchapter.

4.2 Descriptive Data Analysis

The coherence between trust and its alleged impact on the consumer's purchase intention under uncertainty is empirically assessed through a pan-European survey conducted in spring 2004.[50] The survey is based on the questionnaire attached in appendix III which consists of 62 questions that can be assigned to three different sections as illustrated in table 4.1.[51]

Table 4.1 Structure of the questionnaire

Section	Subject	Questions
1	Consumer's attitudes and purchasing habits	1-21
2	food safety information, perceived risk and trust	22-49
3	socio-demographic characteristics	50-62

[50] In the context of this publication, *Europe* refers to the United Kingdom, France, Italy, the Netherlands, and Germany. The survey was restricted to these countries. The questionnaire was translated to the respective language employing the back-translation method which aims at ensuring an invariance of meaning with regard to the wording of questions across different countries.

[51] The questions are based on the TACT guidelines as illustrated in footnote 43 (Ajzen, 2005).

Naturally, not all questions are equally well suited to reflect the impact of trust in food safety information on the consumer's process of decision making. In order to selectively confine the object of investigation to trust as a determinant of consumer behaviour, questions that are only distantly related are not considered in this investigation but are exploited in other publications (Dierks, 2005; Di Marchi, 2004; Mazzocchi et al., 2005a and 2005b).

Initially, a tentative draft of the questionnaire was tested in a pan-European pilot study among 126 households in April 2004 and subsequently adjusted according to methodological requirements.[52] Due to its minor numerical significance and in order to avoid a bias of the data, the pilot study has consequently not been integrated into the findings of the survey but has been discussed in a previous publication (Dierks, 2005).

The survey – based on a revised questionnaire – was conducted throughout May and June 2004 and consists of a total of 2,725 observations. In order to ensure the sample's representativeness in each of the countries, five separate surveys with identical characteristics except for the indispensable translation were conceived. The reference population is composed by all European households with the latter consequently being the sampling unit.[53] Since a sampling frame significant at national level for those in charge of purchasing food is nearly impossible, it is obvious to maintain the household as the sampling unit and to ensure that the respondent is representative for the entire household. The sample is based on simple random sampling and probabilistic extraction which guarantees national representativeness. Even though a *stratification variable* was not explicitly required, most national samples adopted a geographical stratification with proportional sampling (Mazzocchi, 2004, p. 3). Each observation corresponds to a thirty minute face-to-face, in-home interview with the family member responsible for purchase and/or preparation of food[54], since otherwise the information required would be strongly biased.[55]

52 The adjustments included the limitation of the survey's duration to thirty minutes and the revision of apparently incomprehensible questions, for example.

53 Since the respective households have been extracted randomly from a sampling frame which does not exclude any particular subgroup of the population, the sample can safely be assumed as representative of the respective country. This facilitates the illustration of differences that could be imputed to country-specific particularities.

54 According to Halk (1992, p. 120), these persons are more involved in the issue of food safety than the average.

55 Naturally, the term *family* also comprises households that consist of only one person.

Within the scope of the initially outlined European Commission's research project *Food Risk Communication and Consumers' Trust in the Food Supply Chain*, the decentrally collected country-specific observations were transmitted to the University of Reading where the data was collated and processed throughout July 2004. Subsequent to its conversion into a single data set, elementary statistical analyses and estimations were performed on the data and then placed at the disposal of the respective cooperating institutions. This task was mostly performed by Lobb et al. (2005), Mazzocchi et al. (2005a), and Cavicchi et al. (2005), whose efforts provide the data basis for the analyses conducted in the following chapters. This rather uncommon procedure is attributed to a contractual agreement within the research project which assigns the task of data preparation exclusively to the University of Reading.

Table 4.2 Number of respondents by country, gender, marital status, and children

	Survey		Gender		Marital Status			Children	
	Number	Percent	Female	Male	single	married	other	yes	no
UK	533	19.6	87.6	12.4	22.2	51.6	26.1	57.4	42.6
France	622	22.8	68.0	32.0	32.2	58.3	9.5	41.2	58.8
Italy	580	21.3	51.0	49.0	29.4	59.2	11.3	32.9	67.1
Netherlands	539	19.8	70.8	29.2	26.6	68.2	5.2	40.6	59.4
Germany	451	16.6	70.0	30.0	24.4	63.0	12.6	44.3	55.7
Total	2,725	100	69.1	30.9	27.3	59.9	12.8	42.9	57.1

Source: Modified from Lobb et al., 2005, p. A 26. Rounding errors may occur.

As a result, the sample shows a strong prevalence of females (69.1%) and a dominance of married respondents (59.9%) with no children (57.1%) as depicted in table 4.2. The respondent's mean age is 45 years with a minimum of 18 and a maximum of 94 years (Lobb et al., 2005, p. 5). The age structure of children living in the households is illustrated in table 4.3.

Table 4.3 Age structure of children in European households (in percent)

Number of children	under 3 years	3 to 11 years	11 to 16 years	elder than 16 years
one child	70.9	71.4	65.8	64.7
two children	23.5	25.4	28.3	29.1
three children	5.2	3.2	5.2	5.8
four children	0.3	0.0	0.7	0.0
more than four children	0.0	0.0	0.0	0.4
Total	100	100	100	100

Source: Modified from Lobb et al., 2005, p. A 30. Rounding errors may occur.

Most interviewed households have either one (68.2%) or two children (26.6%) whose affiliation to the age groups depicted in table 4.3 seems well-balanced. Other socio-economic

and socio-demographic characteristics appear to be reasonably well-balanced and will therefore not be taken into further consideration.

Since the respective surveys were conducted separately for organisational reasons, it was not possible to obtain an exactly similar volume of respondents in each of the five countries. Thus, national survey sizes range from 451 counts in Germany to 622 respondents in France and do not comply with the scheduled number of 600 respondents per country. Still, their respective weighs seem to be approximately comparable at large. Despite this comparability in a wider sense, certain socio-demographic characteristics exhibit country-specific features that will briefly be outlined in the following. Regarding the respondent's gender, for example, the numbers from both the United Kingdom (87.6%) and Italy (51.0%) clearly diverge from the pan-European mean which shows a strong prevalence of females (69.1%).[56] Moreover, whilst on average 59.9 percent of all respondents are married, this applies to only 51.6 percent in the United Kingdom but to 68.2 percent of the respondents in the Netherlands. With respect to the mean of 57.1 percent of the sample indicating to be childless, the strongest deviations are to be found in Italy, where the respective share amounts to 67.1 percent, and the United Kingdom, again, where it accounts for only 42.6 percent of the sample. Almost two thirds, i.e. 64.0 percent of the children living in the respondents' households are under the age of 16 years (Lobb et al., 2005, p. A 30).

Table 4.4 Average size of sample units (in percent)

	UK		France		Italy		Netherlands		Germany		Total	
persons	valid	cumul	valid	cumul	valid	cumul	valid	cumul	valid	cumul	valid	cumul
1	13.5	13.5	26.8	26.8	15.9	15.9	20.0	20.0	17.8	17.8	19.0	19.0
2	30.0	43.5	34.1	60.9	30.1	46.0	32.2	52.2	37.6	55.4	32.6	51.6
3	21.8	64.3	15.9	76.8	24.4	70.4	15.4	67.6	21.6	77.0	19.7	71.3
4	23.1	87.4	16.6	93.4	23.0	93.4	19.9	87.5	16.4	93.4	19.8	91.1
≥ 5	12.6	100	6.6	100	6.6	100	12.6	100	6.6	100	8.8	100
average	2.9		2.5		2.8		2.8		2.6		2.7	

Source: Modified from Lobb et al., 2005, p. A 29. Note: *cumul* indicates the cumulative percentage. Rounding errors may occur.

Since the household, as previously explained, is regarded as the sampling unit, particular attention is turned to its consistency. The sample's weighed mean value of persons in a household amounts to 2.7 persons and ranges from 2.9 persons in the United Kingdom to 2.5 persons in France. On average, 91.1 percent of the households consist of one to four persons

[56] This particularly low value can be attributed to a sampling error within the Italian sample (Lobb et al., 2005, p. 3).

with a minimum of 87.4 percent in the United Kingdom and a maximum of 93.4 percent in France, Italy, and Germany as illustrated in table 4.4. Compared to the *true* numbers as depicted in table 4.5, the sample's values appear to generally draw a relatively appropriate image of reality. Still, the share of single-person households in the sample (19.0%) is significantly less than its analogue based on true values (31.0%). Particularly the sample's ratio of only 13.5 percent of single-person households in the United Kingdom does not correspond to the actual ratio of 29.0 percent. This also holds for the Netherlands where the sample's ratio of single-person households amounts to 20.0 percent compared to an actual ratio of 34.1 percent and for Germany where the corresponding values amount to 17.8 percent and 37.0 percent, respectively. Regarding other than single-person households, 32.6 percent of the respondents live with another person (actual ratio: 32.0%) whilst 19.7 percent (16.0%) live in households with three and 19.8 percent (14.0%) in households with four persons, respectively. Thus, the ratios of most other household sizes appear to be slightly elevated compared to the actual figures. This is reflected in the sample's average household sizes which consequently are above the actual numbers. Hence, according to the sample, the average household consists of 2.9 persons in the United Kingdom, 2.8 persons in the Netherlands, and 2.6 persons in Germany compared to actual figures indicating a size of 2.5 persons in the United Kingdom, 2.3 persons in the Netherlands and 2.1 persons in Germany, respectively.

Table 4.5 True number of households by country and size in 2003 (in percent)

	UK		France		Italy		Netherlands		Germany		Total	
persons	valid	cumul	valid	cumul	valid	cumul	valid	cumul	valid	cumul	valid	cumul
1	29.0	29.0	31.0	31.0	24.9	24.9	34.1	34.1	37.0	37.0	31.0	31.0
2	35.0	64.0	31.1	62.1	27.1	52.0	32.8	66.9	33.8	70.8	32.0	63.0
3	16.0	80.0	16.2	78.3	21.6	73.6	12.9	79.8	14.0	84.8	16.0	79.0
4	14.0	94.0	13.8	92.1	19.0	92.6	13.8	93.6	11.0	95.8	14.0	93.0
≥ 5	7.0	100	7.9	100	7.5	100	6.4	100	4.2	100	6.0	100
all (m)	24.5		23.8		21.8		6.9		38.9		115.9	
average	2.4		2.4		2.6		2.3		2.1		2.3	

Note: *cumul* indicates the cumulative percentage. Rounding errors may occur. Sources: Office for National Statistics (United Kingdom), Institut National de la Statistique et des Études Économiques (France), Istituto Nazionale di Statistica (Italy), Centraal Bureau voor de Statistiek (The Netherlands), Statistisches Bundesamt (Germany).

In addition to the above, interviewees were asked to approximate their household's gross annual income range. Contrary to expectations, an average of 28.6 percent of the pan-European respondents refused to answer as illustrated in table 4.6. This holds particularly for Dutch respondents of which less than 53.6 percent chose to answer – compared to Germany,

where *all* interviewees responded.[57] More than three quarters (75.6%) of the remaining 1,946 respondents that chose to answer earn less than 45,000 euro annually.[58] Particularly French respondents appear to earn less than their European counterparts with more than one third (34.1%) of the interviewees quoting to earn less than 15,000 euro per annum. Respondents from the United Kingdom and the Netherlands, in contrast, seem to be among the best earning with 15.7 percent and 23.7 percent, respectively, of the respondents indicating a gross annual income that exceeds 60,000 euro.

Table 4.6 Gross annual household income (in euro)

	Country					
	UK	France	Italy	Netherland	Germany	EU
< 15,000	17.4	26.5	11.4	6.5	15.2	15.7
15,000-29,999	23.4	32.5	21.7	12.3	31.8	24.0
30,000-44,999	13.0	12.5	13.5	11.6	24.9	14.3
45,000-59,999	11.9	3.5	7.6	10.5	14.6	9.0
60,000-89,999	8.3	1.8	2.9	8.4	10.9	5.9
90,000-120,000	2.6	0.3	0.5	2.4	2.0	1.5
> 120,000	1.3	0.5	0.2	1.9	0.6	0.9
No response	22.1	22.3	42.1	46.4	0.0	28.6
Total	100	100	100	100	100	100

Source: Modified from Lobb et al., 2005, p. A 30. Rounding errors may occur.

In order to complement the significance of the above answers, a second measure of the household's financial situation was taken into consideration. This measure is a purely verbal description of the financial situation ranging from *not very well off* to *well off* as depicted in table 4.7.

Table 4.7 Evaluation of the households' financial situation

	Country					Total
	UK	France	Italy	Netherlands	Germany	
Not very well off	10.5	1.9	2.4	1.6	4.9	4.1
Difficult	15.4	12.9	9.1	5.6	6.5	10.2
Modest	36.8	34.8	44.3	21.1	26.0	33.3
Reasonable	33.5	40.8	33.1	30.7	37.4	35.2
Well off	3.8	9.5	11.0	41.0	25.3	17.2
Total	100	100	100	100	100	100

Source: Modified from Lobb et al., 2005, p. A 31. Rounding errors may occur.

[57] Possibly, the respondents' faint resonance to this question might imply marginally biased data.

[58] Naturally, the currency was adjusted to British Pounds in the United Kingdom.

Generally, 68.5 percent of all respondents judge their situation to be modest (33.3%) to reasonable (35.2%). Paradoxically, more than a quarter (25.9%) of the respondents from the United Kingdom consider themselves to be in an either difficult (15.4%) or worse (10.5%) financial situation. In accordance with the numerical data, 71.7 percent of the Dutch respondents indicate to be in a reasonable (30.7%) or better (41.0%) financial situation.

Across the European sample, 39.6 percent of the respondents have completed a maximum of lower secondary school education. Regarding regional distinctions, it seems worth noting that both Germany (54.0%) and France (54.5%) exhibit the largest percentage of respondents that were educated to a maximum of lower secondary school. With a value of 15.0 percent the Netherlands display the highest proportion of respondents with a university degree whilst the French sample has the highest share of respondents (11.2%) with no formal education as illustrated in table 4.8.

Table 4.8 Respondents' level of education (in percent)

	Country					
	UK	France	Italy	Netherlands	Germany	EU
No formal education	3.8	11.2	1.6	0.4	2.2	4.1
Primary School	1.0	10.8	11.5	1.9	21.2	9.0
Lower Secondary	22.0	32.5	25.8	21.2	30.6	26.5
Higher Secondary	46.9	15.9	45.1	35.8	19.9	32.7
Tertiary Education	15.3	19.3	3.1	25.8	16.3	15.9
University Degree	10.9	10.4	12.9	15.0	9.8	11.8
Total	100	100	100	100	100	100

Source: Modified from Mazzocchi et al., 2005a, p. 14. Rounding errors may occur.

An analysis of the respondents' occupational status yields that on average, 41.4 percent of all respondents are employed full time whilst 19.2 percent have retired (table 4.9). The proportion of full time employees ranges from 55.1 percent in France to 29.0 percent in the United Kingdom, whereas the share of retirees ranges from 8.0 percent in the Netherlands to 27.6 percent in France. Respondents that indicated to be employed part time mount to an average of 17.8 percent of the sample with values from 6.7 percent in Italy to 36.9 percent in the Netherlands. Unemployed and students account for only 4.1 and 4.3 percent, respectively, of the sample.

Table 4.9 Respondents' status of occupation (in percent)

	Country					Total
	UK	France	Italy	Netherlands	Germany	
Employed full time	29.0	55.1	44.8	34.3	41.1	41.4
Unemployed	4.9	4.5	3.5	2.4	5.4	4.1
Retired	18.8	27.6	23.4	8.0	16.2	19.2
Employed part time	25.2	7.3	6.7	36.9	15.1	17.8
Student	3.2	2.6	7.7	4.1	4.0	4.3
Household keeper	18.8	2.9	13.9	14.3	18.2	13.1
Total	100	100	100	100	100	100

Source: Modified from Mazzocchi et al., 2005a, p. 16.

Considering the intention-behaviour-relationship, the emphasis on the consumers' purchasing habits seems to be well-suited since 93.2 percent of all respondents indicate to purchase foods for their household's consumption at least once a week as illustrated in table 4.10. Half the respondents, i.e. on average 54.6 percent, state to shop for their household's home consumption between once and twice a week. In doing so, 60.8 percent of the sample spend between 45 and 119 euro per week on food for the household's home consumption.[59] Considering an average household size of 2.7 persons, the individually attributable amount thus lies between 17 and 44 euro per week spent on food for home consumption (Lobb et al., 2005, p. 6).

Since a commensurable reaction to a (hypothetical) food safety incidence can only be expected if a multitude of consumers fears to be potentially affected, a familiar and popular food of frequent purchase throughout Europe needed to be selected.[60] Consequently, *chicken*, which had already previously been the centre of serious food scares like the dioxin chicken scandal in Belgium in 1999, for example, was selected as the object of investigation (Graffeo et al., 2004, p. 322).[61] As illustrated in table 4.10, merely 9.4 percent of the respondents *never* buy any type of chicken for their household.[62] Particularly vegetarians and vegans, whose combined share in the sample amounts to 158 individuals (5.8%), account for these answers (Lobb et al., 2005, p. 6).

59 Naturally, the currency was adjusted to British Pounds in the United Kingdom.

60 In consistency with the Theory of Planned Behaviour, the intention to *purchase* chicken is synonymical to its *consumption* at this stage of the analysis.

61 During the Belgian dioxin chicken scandal in 1999, large quantities of chicken and eggs were found to be heavily contaminated with polychlorinated biphenyl (PCB) and dioxin (Graffeo et al., 2004, p. 321).

62 Despite their numerical insignificance (0.7%), respondents who indicated to *never* purchase *any* foods were not further considered, naturally.

Table 4.10 The frequency of purchasing (in percent)

	foods in general	any type of chicken	fresh chicken	frozen chicken
Never	0.7	9.4	15.7	62.0
Not every week	6.1	41.6	44.5	28.7
Once a week	26.3	34.6	31.0	7.9
Twice a week	28.3	11.2	6.8	1.1
Three times a week	17.3	2.6	1.5	0.3
More frequently	21.3	0.6	0.4	0.0
Total	100	100	100	100

Source: Modified from Lobb et al., 2005, p. A 32. Rounding errors may occur.

Thus, considering that 49.0 percent of the respondents buy any type of chicken at least once a week, a food safety incidence in this sector is legitimately assumed to affect a greater part of the households. This supposition is additionally endorsed taking into account that 90.6 percent of the respondents intend to purchase any type of chicken in principle, even though less frequently than at least once a week. Further affirmation of the above statements is found in table 4.11 which illustrates the respondents' individual *likelihood* of purchasing chicken under normal circumstances for their household's home consumption in the current week.

The latter is measured on a seven point *Likert scale* which ranges from one which means 'very unlikely' to seven – 'very likely'. The previously elucidated global variables such as attitude, subjective norm, or perceived behavioural control were elicited both in a direct and an indirect manner. Whilst the direct manner comprehends the seven point Likert scale and is anchored with corresponding statements, the indirect manner consists of a set of specific questions that aim at identifying the variables' sub-determinants (East, 1997, p. 43; Cook et al., 2002, p. 564). Furthermore, each respondent was asked to identify up to three chicken-specific attributes considered to be most relevant when deciding whether to purchase chicken or not. This measure includes the issue of *saliency*, since usually, i.e. under normal circumstances consumers only take a small number of product characteristics into account when choosing food products (East, 1997, p. 72). The questions particularly investigating perceived risk and trust were conceptualised on the basis of a set of food safety information sources in relation to the risks of salmonellae in food and measured on a seven point Likert scale, again.

Table 4.11 Consumers' likelihood of purchasing chicken (in percent)

	Count	Percentage	Valid Percent	Cumulated Percent
unlikely	204	7.5	8.4	8.4
2	128	4.7	5.3	13.7
3	159	5.8	6.5	20.2
neither	375	13.8	15.4	35.6
5	399	14.6	16.4	52.1
6	519	19.0	21.4	73.4
likely	646	23.7	26.6	100
Subtotal	2,430	89.2	100	
missing	295	10.8		
Total	2,725	100		

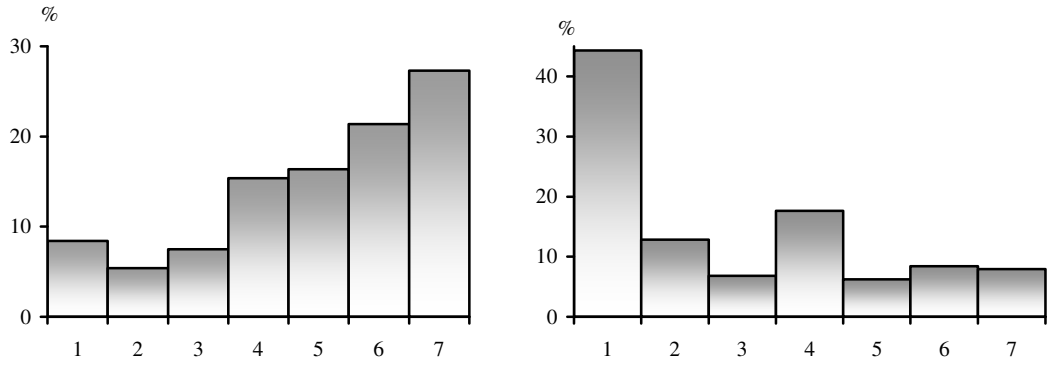
Source: Modified from Lobb et al., 2005, p. A 34. Rounding errors may occur.

Regarding the European sample, on average 64.4 percent of the respondents indicate that their likelihood of purchasing chicken in the present week exceeds the neutral value of four. In a standard purchasing situation as graphically represented in figure 4.1, these 1,564 respondents evince a high probability to purchase chicken in the current week, corresponding to five points or more on the seven point Likert scale. Only 491 respondents (20.2%), in contrast, reveal a low likelihood, corresponding to three points or less on the seven point Likert scale. 375 respondents (15.4%), finally, remain undecided, corresponding to four points on the seven point Likert scale.

Unsurprisingly, this image abruptly changes following the respondents' confrontation with a hypothetical food safety incidence (Lobb et al., 2005, p. 14).[63] As illustrated in figure 4.2, almost half the respondents (44.3%) regard it as extremely unlikely to purchase chicken for the household's home consumption in the aftermaths of a salmonella outbreak, thereby substantiating both an increase in the risk consumers perceive and a clear shift towards a more reserved behaviour in their intention to behave.[64]

63 The 2,430 responses depicted in figures 4.1 and 4.2, respectively, exhibit a mean value of 2.8 and a standard deviation of 2.04 on the underlying seven point Likert-scale.

64 The values depicted in figures 4.1 and 4.2 refer to a seven point Likert scale. Respondents that selected the value one indicate an extremely low likelihood whereas respondents that selected the value seven indicate a very high likelihood to purchase chicken for the household's home consumption in the week following the interview.



Figures 4.1 and 4.2 Respondents' Intention to Purchase Chicken *before* and *after* a Food Safety Incidence (in percent). Source: Modified from Lobb et al., 2005, p. 14.

Overall, two thirds of the sample can be expected to purchase chicken for their household's home consumption in the present week – with regional distinctions considering the demanded *quality*, however. As illustrated in table 4.12, more than half the respondents, i.e. 54.1 percent, generally purchase *standard chicken* with country-specific values ranging from 27.2 percent in France to 73.1 percent in the United Kingdom.[65] This result changes when considering *luxury chicken* which on average 19.4 percent of the respondents purchase with country-specific values ranging from 5.2 percent in the Netherlands and 5.3 percent in the United Kingdom to 45.4 percent in France, respectively. According to table 4.12, the share of *value chicken* lies between 2.1 percent in the Netherlands and 23.4 percent in Germany. The pan-European average value amounts to 9.3 percent. This is mostly comparable to the percentage of organic chicken which amounts to 8.6 percent throughout Europe with an exception in France where 11.5 percent of the respondents indicate to purchase it and the United Kingdom, again, where the share amounts to only 4.6 percent.

Table 4.12 Types of chicken purchased for home consumption (in percent)

	Country					Total
	UK	France	Italy	Netherlands	Germany	
Does not know	5.1	8.7	4.0	12.7	14.2	8.6
Value chicken	11.9	7.2	5.1	2.1	23.4	9.3
Standard chicken	73.1	27.2	67.2	70.4	31.6	54.1
Organic chicken	4.6	11.5	7.3	9.6	10.0	8.6
Luxury chicken	5.3	45.4	16.4	5.2	20.9	19.4
Total	100	100	100	100	100	100

Source: Modified from Lobb et al., 2005, p. A 33.

65 Regarding the classification of chicken, respondents were explained that *value chicken* is the cheapest variety of chicken that can be purchased at a discounter whereas *standard chicken* is the chicken that can be found on the shelf of a typical supermarket. *Luxury chicken* is the equivalent of corn fed or free range chicken or brand chicken like *Tesco Finest Chicken* in the United Kingdom or *Wiesenhof* in Germany Organic chicken corresponds to organically produced chicken labelled as such (Lobb et al., 2005, p. 5).

In addition to typologising the chicken's quality, the consumers' preferred supplier and the respective amount of chicken purchased has been investigated. On average, 75.1 percent of the respondents obtain their chicken from supermarkets, with percentages oscillating between 85.8 percent in the United Kingdom and 44.1 percent in Germany. German respondents are most likely to purchase chicken at a discount store (32.4%) or a local shop (16.5%), whilst the British respondents are least likely to purchase their chicken from a discount store (5.2%). French respondents, in turn, are least likely to purchase from a local store (3%) but most likely to purchase either from a farmer (27.1%) or a market (32.4%). British consumers are the least likely to purchase from these sources (1.1% and 3.0%, respectively). Italian respondents, finally, are most likely to purchase their chicken from a butcher (57.8%), whilst German consumers are the least likely (13.2%).
Considering typical weekly consumption figures, every household purchases one kilogram of chicken on average, with a minimum of none and a maximum of 25 kilograms. These purchasing patterns correspond to an average amount of six euro that the household spends for chicken in a typical week with a minimum of zero and a maximum of 82 euro (Lobb et al., 2005, p. 7).

In a succeeding step, particular emphasis is placed on the respondents' evaluation of food safety which, according to table 4.13, 52.2 percent of the sample consider to be extremely important.

Table 4.13 Consumers' evaluation of food safety (in percent)

	Country					Total
	UK	France	Italy	Netherlands	Germany	
unimportant	0.9	0.8	0.2	0.2	0.2	0.5
2	0.2	1.3	0.2	0.4	0.2	0.5
3	0.9	1.9	0.3	2.1	0.4	1.2
neither	2.6	7.9	2.4	6.0	4.2	4.7
5	11.7	14.1	9.8	12.9	21.1	13.6
6	20.1	27.6	29.7	28.0	31.7	27.3
important	63.5	46.4	57.4	50.6	42.1	52.2
Total	100	100	100	100	100	100

Source: Modified from Lobb et al., 2005, p. A 34.

More than 93.1 percent of the sample rank food safety above the neutral value of four on a seven point Likert scale which assigns the value of one to 'unimportant' and seven to 'important'. Country-specific evaluations of food safety being an important issue range from

88.1 percent in France to 96.9 percent in Italy. Evaluations from other countries correspond to the mean value, approximately.

Taking into account the (expected) grave meaning of food safety for consumers, chicken furthermore seems to be a suitable frame of reference of the survey since consumers mostly perceive the risk of its consumption as being below average (table 4.14 and 4.15). Any incidence will therefore strike consumers rather unexpectedly and might yield more severe reactions compared to its occurrence in other sectors. In accordance with the selection of chicken as an exemplary food within the survey, the food safety incident will in the following be concretised as a *salmonellae outbreak*.

Table 4.14 Consumers' consent to the statement of chicken being a safe food (in percent)

	Country					Total
	UK	France	Italy	Netherlands	Germany	
disagree	2.9	6.8	3.0	5.1	4.7	4.6
2	3.1	4.3	2.8	9.7	3.8	4.7
3	7.0	6.3	4.9	17.8	6.3	8.3
neither	24.4	30.9	21.9	29.2	21.9	25.8
5	21.2	13.4	30.2	17.4	29.3	22.0
6	22.4	20.4	21.9	13.4	20.4	19.8
agree	18.9	17.9	15.3	7.3	13.6	14.8
Total	100	100	100	100	100	100

Source: Modified from Lobb et al., 2005, p. A 34.

Considering everyday occurrences, 56.6 percent of the respondents indicate that they tendentially agree with the statement that *chicken is a safe food* whereas only 17.6 percent regard it as an unsafe food as depicted in table 4.14.[66] Approximately a quarter of the European sample, i.e. 25.8 percent, considers chicken to be neither safe nor unsafe and thus assign the neutral value of four to their degree of consent. Regarding the respective countries, however, the consumers' general consent to the above statement that chicken is a safe food ranges from 38.1 percent in the Netherlands to 67.4 percent in Italy.

In a slightly changed version of the question that required consumers to indicate how they would rate consuming chicken in terms of risk to their state of health, 26.1 percent responded that they consider this particular risk to be negligible. Moreover, a total of 68.6 percent of the

[66] Again, consumers are understood to agree on the statement of chicken being a safe food provided that they assign a number above the neutral value of four to their level of consent. The latter is measured on a seven point Likert scale which assigns a value of one to 'disagree' and seven to 'agree'.

sample judges the risk to be below average as illustrated in table 4.15. Regarding regional distinctions, it seems worth noting that 62.0 percent of the Italian but 77.5 percent of the French respondents judge the respective risk to be below average. Generally, European consumers consider themselves as having only low or negligible knowledge of health risks specially related to chicken (Lobb et al., 2005, p. 8).

Table 4.15 Evaluation of health risks attributed to the consumption of chicken (in percent)

	Country					Mean
	UK	France	Italy	Netherlands	Germany	
negligible	27.4	37.6	22.8	21.4	18.4	26.1
2	27.3	25.5	24.9	28.1	26.6	26.4
3	15.4	14.4	14.3	19.6	17.3	16.1
average	17.7	14.2	22.8	18.4	26.4	19.6
5	7.3	5.5	11.7	9.3	6.9	8.2
6	3.2	2.4	2.2	2.0	4.4	2.8
high	1.7	0.5	1.2	1.1		0.9
Total	100	100	100	100	100	100

Source: Modified from Lobb et al., 2005, p. A 38.

The image of chicken as an alleged safe food is further endorsed through the consumers' notion of contents such as fat or cholesterol. Accordingly, chicken is generally perceived to be low in fat and cholesterol – even though no scientifically verified connection between the consumption of chicken and the human blood cholesterol level has been established to date. Across the sample, respondents mainly judge the respective importance of both fat and cholesterol to be above the neutral value of four, corresponding to an awareness of a possibly negative impact on their diet. Whilst these contents are regarded as relevant particularly in Italy where 86.1 percent and 85.6 percent of the respondents, respectively, assign a value of five or above on a seven point Likert scale to the issue, it appears to be of less importance in France, where the share of alert respondents amounts to 64.5 percent and 57.9 percent, respectively. This suggests that Italian consumers represent the most health-conscious group in the sample whereas French respondents appear to be the least concerned as illustrated in table 4.16.

Beside these sanitary aspects, respondents were requested to indicate salient reasons decisive for the purchase of chicken for home consumption.[67] Across the sample, the three most given

[67] Based on a seven point Likert scale, respondents were asked to assign a value between one, indicating disapproval, and seven, indicating approval, to predefined statements as depicted in question twelve. The above evaluation confines itself to the statements with the three highest scores.

motives are the chickens' good taste, its good value for money, and the fact that the whole family likes chicken – thereby emphasising the facet of chicken being a familiar and popular food as aforesaid. Paradoxically, these characteristics were mentioned in all countries but the Netherlands where respondents ranked the chicken's compatibility with other ingredients among the three most important attributes (Lobb et al., 2005, p. 7).

Table 4.16 The relevance of fat and (cholesterol) (in percent)

	Country					Weighed Mean
	UK	France	Italy	Netherlands	Germany	
unimportant	1.7 (1.9)	5.8 (8.4)	0.9 (0.9)	2.0 (3.0)	0.9 (1.8)	2.4 (3.3)
2	2.1 (2.8)	4.7 (7.3)	0.9 (0.7)	2.2 (4.9)	2.4 (3.1)	2.5 (3.8)
3	4.3 (5.1)	7.3 (6.3)	3.4 (3.3)	5.6 (7.6)	3.3 (4.4)	4.9 (5.4)
average	12.2 (17.3)	17.7 (20.2)	8.8 (9.5)	13.0 (18.7)	14.2 (20.8)	13.2 (17.1)
5	20.3 (20.7)	19.0 (16.3)	16.9 (16.2)	16.8 (15.3)	27.3 (25.9)	19.7 (18.5)
6	24.8 (22.4)	22.4 (18.4)	27.8 (29.1)	29.8 (25.2)	30.2 (25.5)	26.8 (24.0)
important	34.6 (29.9)	23.1 (23.2)	41.4 (40.3)	30.5 (25.4)	21.7 (18.4)	30.5 (27.8)
Total	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)

Source: Modified from Lobb et al., 2005, p. A 35.

With regard to the expansion of the Theory of Planned Behaviour, emphasis is not only put on disclosing the classical determinants, i.e. attitude towards the behaviour, A_B, subjective norm, SN, and perceived behavioural control, PBC, but particularly on the consumer's evaluation of both trust, T, and perceived risk, PR. In a first step, the relevance of these variables is evaluated under common circumstances whereas in a second step a hypothesised salmonella outbreak is taken into consideration. Table 4.17 recapitulates the model's variables and relates them to the respective items in the questionnaire.

Table 4.17 Variables of the estimation model

Variable	Type	Meaning	Question(s)
SN	Global	Subjective Norm	14, 15
PBC	Global	Perceived Behavioural Control	external variable
A_B	Global	Attitudes	9, 10,11
T	Global	Trust	43, 45, 46
PR	Global	Perceived Risk	27, 29
I_B	Global	Intention	2, 4, 5, 6, 7, 8, 19

As previously mentioned, the notion of trust, T, as an unidimensional measure with respect to the behaviour of interest, i.e. the consumer's process of purchasing chicken, appears to be problematic (Mazzocchi et al., 2005a, p. 4). Therefore, different dimensions of trust depending as well on the *type* of trust which can either be *cognitive* or *affective*, as on its

addressees, who comprise media, food chain actors, scientists, and public authorities, among others, have explicitly been taken into consideration as exemplified in questions 43 and 45 of the questionnaire attached in appendix III.[68] Any *aggregate* measure of trust based on the above dimensions would provoke a serious bias and have an ambiguous relation to the behaviour of interest. Whilst trust in food chain actors should generally have a positive effect on purchasing behaviour, this apparently does not account for trust which is directed to sources that provide ambiguous information. Media, for example, can supply both positive and negative information with an unclear effect on the behaviour in question. This evident multidimensionality is investigated in question 43 with findings being quoted in table 4.18.

Table 4.18 Consumers' subjective evaluation of a source's trustworthiness

	Country					
	UK	France	Italy	Netherlands	Germany	EU
Shopkeepers	4.64	5.01	4.72	4.54	4.48	4.69
Supermarkets	4.99	4.48	4.73	4.49	4.54	4.64
Organic Shop	5.27	5.30	5.08	5.14	5.27	5.21
Specialty Store	5.12	5.70	4.05	5.28	4.91	5.01
Farmers	5.07	5.56	4.67	4.56	4.90	4.97
Processors	3.95	3.00	4.01	3.97	3.90	3.74
Health Officials	6.24	5.78	5.91	6.08	5.98	5.99
Scientists	5.53	5.58	5.91	6.04	5.77	5.77
National Authority	5.80	5.62	5.60	6.01	5.98	5.79
Government	4.39	3.90	4.29	5.36	4.67	4.50
Political Groups	3.55	2.89	3.33	3.98	4.04	3.52
Environmental	4.86	4.84	4.78	4.51	5.41	4.86
Animal welfare	4.50	4.67	4.69	4.40	5.34	4.70
Consumer	5.22	5.91	5.58	5.72	6.02	5.69
EFSA	4.62	4.97	5.52	5.41	5.54	5.21
TV documentary	4.96	4.87	4.84	5.05	5.26	4.98
TV news	5.17	4.79	5.15	5.39	5.55	5.19
TV advertising	4.18	2.95	3.56	3.04	3.25	3.38
Newspapers	4.53	5.01	4.87	4.97	5.33	4.94
Internet	4.54	4.25	4.34	4.82	4.77	4.54
Radio	4.86	5.13	4.56	5.00	5.35	4.97
Magazines	4.55	4.48	4.28	4.39	4.81	4.49
Product Label	4.81	5.50	5.19	5.01	4.48	5.03
Average	4.84	4.79	4.77	4.92	5.02	4.86

Source: Modified from Lobb et al., 2005, p. A 40.

Respondents were asked to indicate to which extent they trust information provided by the sources listed above regarding the risks induced through salmonellae in food. Again, their

[68] The term *food chain actors* comprises producers, wholesalers, and retailers and possible intermediate stages.

evaluation is compiled by means of an interval-scaled, seven point Likert scale, which assigns numerical values between one (complete distrust) and seven (complete trust) to each degree of trust. The values as specified in table 4.18 are calculated from the totality of all responses.

Among the most trusted sources of information across all countries are as well health officials with a value of 5.99 as national food safety authorities (5.79) and scientists (5.77). With a value of 5.21, the European Food Safety Agency (EFSA) is not trusted as much as its national counterparts. Relatively little trust, in contrast, is uttered towards processors which are assigned a value of 3.74, political groups with 3.52 and television advertising, finally, with a value of 3.38. Surprisingly, the consumer's marital status has no effect on these findings (Lobb et al., 2005, p. 8).
As table 4.18 illustrates, the respondents' subjective evaluation of trust in different sources seems to be reasonably balanced across the examined countries. Yet, on closer examination, certain exceptions remain. Among other sources, trust in food chain actors needs to be highlighted. Whilst farmers are assigned a relatively high value of 5.6 in France, the corresponding value for the Netherlands amounts to only 4.6. Processors, in turn, are assigned a value of 3.0 in France but 4.0 in Italy and the Netherlands, surprisingly. Considering trust in information provided by the government and political parties, national distinctions appear to be even more explicit. Whilst the respondents' evaluation of their government's trustworthiness ranges from a comparably high value of 5.4 in the Netherlands to 3.9 in France, the classification of political groups only oscillates between 4.0 in Germany and the Netherlands and 2.9 in France. The evaluation of trust in television advertising, finally, ranges from 4.2 in the United Kingdom to 2.9 in France.
With regard to table 4.18, it can be surmised that on average German respondents (5.02) have more confidence in food safety information from a variety of sources than respondents from other European countries such as Italy (4.77) or France (4.79), for example.

Following this general assessment of trust in different sources, emphasis is placed on a detailed evaluation of the perceived trustworthiness of different suppliers which was compiled by means of an interval-scaled rank order which ranges from zero ("no trust at all") to ten ("completely trustworthy"). The findings are depicted in table 4.19. Albeit the sample's country of origin, organic farmers generally seem to be the most trusted of the selected suppliers with a mean value of 7.3. Above all, French (7.9) and German (7.8) respondents

consider them to be particularly trustworthy whereas industrial breeders (5.0) are the less trusted food chain actors throughout Europe.

Table 4.19 Perceived trustworthiness of selected food chain actors

	Country					Total
	UK	France	Italy	Netherlands	Germany	
Organic farmers	7.1	7.9	6.8	7.0	7.8	7.3
Conventional farmers	6.3	7.1	5.7	6.1	6.7	6.4
Industrial breeders	5.4	5.6	5.4	4.6	4.8	5.0
Brand producers	5.4	6.1	5.7	5.4	5.8	5.7

Source: Modified from Lobb et al., 2005, p. A 40.

Resumptive, the pan-European sample featuring 2,725 respondents from five countries is assumed to draw a representative image of the consumers' intention to purchase chicken both in a standard situation and in the environment of a hypothesised salmonellae outbreak. The tables introduced above facilitate a first impression and thus a brief understanding of consumer behaviour. Bearing in mind the environment of uncertainty, emphasis is placed on the element of trust as a determinant of the respondents' intention to engage in an economic transaction. Following this descriptive analysis of the data set, the succeeding subchapter will focus on additional findings attributed to a cross-country segmentation analysis.

4.3 Segmentation Analysis

According to table 4.1, the questionnaire consists of three different segments which successively address the consumer's attitudes and purchasing habits, the interaction between perceived risk and trust, and selected socio-demographic characteristics. In principle, the data related to these segments should individually undergo a *segmentation analysis* for the purpose of assigning the observations to population clusters. As preliminary results suggest, a segmentation analysis featuring the data related to the consumers' perceived risk and trust yields statistically significant differences with regard to trust in different sources providing information about food safety issues. Consequently, question 43, which appears to be of central importance to this segment, will in the following be examined more closely. In detail, a cross-country segmentation analysis with regard to consumers' trust in the respective sources providing food safety information both in a standard purchasing situation and in the environment of a food safety incidence will be conducted.

A segmentation analysis featuring the data related to the consumer's attitudes and purchasing habits does not yield satisfactory results. Even though the data allows for classifying the consumers into different groups such as conservative or alternative consumers, for example,

no statistically significant correlation between the consumer's attitudes, his purchasing habits and trust could be established. This restriction also holds true for a segmentation analysis featuring the data related to the consumer's socio-demographic characteristics. Again, the data allows for classifying the consumers into four different groups. Yet, group-specific differences of trust in information about food safety, albeit being statistically significant, are too small to differentiate distrusting consumers from their trusting counterparts (Cavicchi et al., 2005, p. 9).

The segmentation analysis consists of two consecutive steps; first, a factor analysis with a *principal components analysis* as an extraction method and, second, a *cluster analysis*. The principal components analysis aims at reducing the dimensionality of the original data set. The cluster analysis aims at allocating a set of individuals to a set of mutually exclusive, exhaustive groups, i.e. to a *partition* such that individuals within a group are similar to one another whilst individuals in different groups are dissimilar (Chatfield and Collins, 1980, p. 212). Taking into consideration the principal components analysis, however, the classification of the observations into population clusters will be conducted on the basis of principal component scores. The advantage of previously conducting this additional step compared to directly performing a cluster analysis on the original data is justified through a reduction of the biases implied through the comprehension of highly correlated variables (Cavicchi et al., 2005, p. 6).[69]

4.3.1 Factor Analysis

A principal components analysis as developed by Pearson (1901) and Hotelling (1933) is a statistical technique to analyse multivariate data and to linearly transform the original variables into substantially less new variables, generally referred to as *principal components*, which are mostly uncorrelated and account for decreasing proportions of the variance in the data (Everitt, 1998, p. 261). As mentioned above, this step aims at reducing the dimensionality of the original data set in order to obtain a small set of *uncorrelated variables* instead of a larger set of *correlated variables* (Dunteman, 1989, p. 7). Formally, the first principal component, y_1, is a linear combination of the random variables $x_1, x_2, \ldots, x_n$, i.e.

[69] According to Dunteman (1989, p. 78), however, there is no advantage in transforming the original observations to principal component scores prior to the clustering since the same information is contained in the original and the transformed data. For any distance function, the distances among observations computed from principal component scores are equal to the corresponding distances computed from the original, variable scores using an equivalent but different distance function.

$$y_1 = a_{11}x_1 + a_{12}x_2 + ... + a_{1n}x_n = \sum_{i=1}^{n} a_{1i}x_i$$

such that the variance of y_1 is maximised subject to the constraint that the sum of the squared weights is equal to one, i.e.

$$\sum_{i=1}^{n} a_{1i}^2 = 1 .$$

The random variables, x_i, can be a deviation from either mean or standardised scores. Any maximisation of the variance of y_1 also applies to the sum of the squared correlations of y_1 with the original variables $x_1, x_2,\ldots, x_n$, or

$$\sum_{i=1}^{n} r_{y,x_i}^2 ,$$

respectively.

The principal components analysis then aims at identifying the optimal weight vector and the associated variance of y_1. The second principal component, y_2, requires a second weight vector,

$$a_{21,}\, a_{22}, ..., a_{2n},$$

such that the variance of

$$y_2 = a_{21}x_1 + a_{22}x_2 + ... + a_{2n}x_n = \sum_{i=1}^{n} a_{2i}x_i$$

is maximised subject to the constraints that it is mostly uncorrelated with the first principal component and that the sum of the squared weights is equal to one

$$\sum_{i=1}^{n} a_{2i}^2 = 1 .$$

This results in y_2 having the next largest sum of squared correlations with the original variables. This sum, however, or, equivalently, the variance of the principal components, decreases as successive principal components are extracted. The first principal components thus have the highest sum of squared multiple correlations

$$\sum_{i=1}^{n} R^2_{x_i y_1, y_2}$$

with the n variables (Dunteman, 1989, p. 11). This process can be continued until as many components as variables have been calculated.

Table 4.20 Principal component loadings for trust in food safety information

	Components of Trust				
Information Source	T_M	T_F	T_I	T_A	T_V
Shopkeepers	0.12	**0.81**	0.11	-0.05	0.15
Supermarket	0.17	**0.74**	0.17	-0.06	0.31
Organic Shop	0.11	**0.68**	0.10	**0.40**	-0.05
Specialty Store	0.20	**0.74**	0.08	0.25	0.03
Farmers/Breeders	0.10	**0.73**	0.11	0.11	0.07
Processors	0.11	**0.47**	0.18	-0.04	**0.59**
Health Officials	0.18	0.23	**0.76**	-0.01	0.04
University Scientists	0.18	0.13	**0.72**	0.10	0.07
National Food Authority	0.14	0.16	**0.79**	0.12	0.21
Government	0.21	0.06	**0.50**	0.10	**0.64**
Political Groups	0.28	0.09	0.19	0.28	**0.74**
Environmental Groups	0.21	0.13	0.18	**0.83**	0.15
Animal welfare Organisations	0.18	0.12	0.10	**0.84**	0.16
Consumer Organisations	0.30	0.11	**0.52**	**0.51**	-0.09
EFSA	0.26	0.05	**0.62**	0.23	0.24
Television documentary	**0.67**	0.12	0.22	0.13	0.10
Television news	**0.73**	0.15	0.30	0.03	0.10
Television advertising	**0.40**	0.23	-0.02	0.06	**0.60**
Newspapers	**0.75**	0.15	0.16	0.13	0.13
Internet	**0.63**	0.04	0.13	0.17	0.25
Radio	**0.79**	0.16	0.18	0.15	0.07
Magazines	**0.71**	0.23	0.05	0.15	0.25
Product Label	0.35	**0.43**	0.18	-0.03	0.12
Component Label	*Media*	*Food Chain*	*Independent*	*Alternative*	*Interest*

Note: A *varimax* rotation with Kaiser Normalisation has been conducted. Values exceeding 0.40 are printed bold. Source: Modified from Mazzocchi et al., 2005b, p. 9.

As illustrated in section 4.2, trust in food safety information, T, is composed of different factors, T_j, which will be identified by means of a principal components analysis. This move

explicitly considers the correlations across the sources which the respondent perceives as similar and thus provides first estimates, i.e. *principal component scores* for the latent trust constructs, T_j. These factors as well as their relative component loadings are depicted in table 4.20.

Since the principal components are extracted from a correlation matrix and their average value therefore equals one, components with eigenvalues less than one are excluded.[70] The method thus retains only those components that account for more variance than the average variable. This step yields five principal components and allows for classifying the consumers' trust in food safety information, *T*, into five principal dimensions as illustrated in table 4.21.

Table 4.21 Principal components of trust

Variable	Type of trust
T_M	Trust in information provided by media
T_F	Trust in information provided by food chain actors
T_I	Trust in information provided by independent sources
T_A	Trust in information provided by alternative sources
T_V	Trust in information provided by vested interests

The first component, T_M, refers to the respondents' trust in *media* whereas the second component, T_F, corresponds to the respondents' trust in *food chain actors*. The third component, T_I, comprises the consumers' trust in *independent sources*, even though federal authorities and consumer organisations are also included in this factor. The fourth component, T_A, comprising specialty stores, organic stores, and non-profit organisations, refers to the respondents' trust in *alternative sources* whereas the fifth component, T_V, finally, is assumed to consist of *vested interest* and includes sources as diverse as processors, political groups, and television advertisement.

4.3.2 Cluster Analysis

The concept of cluster analyses comprehends multivariate techniques whose primary purpose is to group entities according to certain characteristics they possess (Hair et al., 1998, p. 473). Basically, the methodology corresponds to multivariate statistical procedures that commence with a data set containing information about a sample of entities and attempts to reorganise

[70] This rule was originally suggested by Kaiser (1958). Following simulation studies, Jolliffe (1973), however, suggests that an alternative procedure would be to exclude components extracted from a correlation matrix whose eigenvalues are less than 0.7.

these entities into relatively homogenous groups with a maximal degree of association (Aldenderfer and Blashfield, 1984, p. 7). The decisive factor is the *similarity* among the entities which is generally calculated on the basis of either *correlation coefficients* or *distance coefficients*. Among the most popular similarity measures are *Pearson's product moment coefficient of correlation*, r_{ij}, and the *Euclidean distance*, d_{ij}.[71]

Pearson's product moment coefficient of correlation, r_{ij}, indicates strength and direction of the linear relationship between any two metric variables and can be expressed as the quotient of their covariance and the square root of the product of two standard deviations as illustrated in equation 4.1

$$r = \frac{\sigma_{ij}}{\sqrt{\sigma_{ii}\sigma_{jj}}}, \tag{4.1}$$

with

$$\sigma_{ij} = \sum_{i=1}^{n} \left(x_i - \bar{x}\right)\left(y_i - \bar{y}\right),$$

$$\sigma_{ii} = \sum_{i=1}^{n} \left(x_i - \bar{x}\right)^2,$$

$$\sigma_{jj} = \sum_{i=1}^{n} \left(y_i - \bar{y}\right)^2,$$

$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$, and

$\bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i$, respectively.

The coefficient of correlation can vary within the interval of *+1* and *-1*. If its value corresponds to or is near zero, there exists no linear relationship between the random variables *x* and *y* which can then be assumed to be uncorrelated. If *r* corresponds to either *+1* or *-1*, a functional (causal) relationship for the pair of variates can be assumed. The closer *r* is to either *+1* or *–1*, the stronger the linear relationship between *x* and *y*. The coefficient of

[71] A capacious review of other similarity measures such as the *Manhattan distance* or *city-block metric*, the *Minkowski metrics*, the *Chebychev distance*, and *Mahalanobis* D^2 is provided by Everitt (1993, p. 47).

correlation's values between zero and either +1 or -1 correspond to a stochastic but not necessarily causal relationship. The case of a formal but not causal relationship is generally referred to as a *spurious correlation*. Alternatively, the coefficient of determination, which basically corresponds to the coefficient of correlation's quadratic value and indicates the combined variance, is used instead (Johnson et al., 1995, p. 81).

In contrast to Pearson's product moment coefficient of correlation, the Euclidean distance in fact is a *dis*similarity measure that indicates the geometric distance between entities in a multidimensional space (Aldenderfer and Blashfield, 1984, p. 25). As denoted in equation 4.2, the Euclidean distance, d_{ij} , in n dimensions is formally defined as

$$d_{ij} = \sqrt{\sum_{k=1}^{n} \left(x_{ik} - x_{jk}\right)^2} \qquad (4.2)$$

with d_{ij} as the distance between the entities i and j and x_{ik} as the value of the k-th variable for the i-th entity (Everitt and Dunn, 2001, p. 94).[72] Despite their frequent application, Euclidian and other distance metrics are susceptible for difficulties such as the estimation of the similarity between entities being strongly affected by elevation differences, for instance. Variables with both large size differences and standard deviations can cover the effects of variables with smaller absolute sizes and standard deviations (Aldenderfer and Blashfield, 1984, p. 26). Moreover, the Euclidean distance is affected by transformations of the scale of measurement of the variables since distance metrics usually do not preserve distance rankings (Everitt, 1993, p. 47).

Following the measurement of distances between the respective observations, the multitude of entities – which still correspond to one cluster each – need to be assorted into relatively homogenous groups by means of an either *hierarchical* or *non-hierarchical* amalgamation rule.[73] In the following, emphasis will be placed on a hierarchical approach, the *Ward method*, and a non-hierarchical approach, the *k-means method*.

The Ward method aims at minimising the sum of squares within the cluster over all partitions obtainable by combining a pair of any two (hypothetical) clusters (Ward, 1963,

[72] The Euclidean distance is occasionally applied in its squared form in order to augment the relative weight between variables with a larger size difference (Everitt and Dunn, 2001, p. 96).

[73] A capacious review of amalgamation rules is presented in Aldenderfer and Blashfield (1984, p. 50) and includes *single* and *complete linkage*, *weighed* and *unweighed pair-group average*, and *weighed* and *unweighed pair-group centroid*.

p. 239). The distance between any two clusters is expressed as an error-sum-of-squares (ESS) as depicted in equation 4.3

$$ESS_{Ward} = \sum_{i=1}^{n} (x_i - \bar{x})^2 \tag{4.3}$$

with x_i as the value of the *i-th* entity and the distance, *ESS*, being the sum of squares between the two clusters summed over all variables. Even though this method appears to be relatively efficient, it tends to create clusters of small size.

The k-means method, like all non-hierarchical approaches, is only applicable when the number of clusters has been determined a priori (MacQueen, 1967, p. 284). Following the initial partition of the observations into *k* clusters, each entity is in turn examined and reassigned, if appropriate, to a different cluster in an attempt to minimise the distance between the entities and their respective cluster's centroid. This step will both minimise the variability within clusters and maximise variability between clusters. Formally, the k-means method aims at minimising the sum of the squared distances to the cluster's centres as illustrated in equation 4.4.

$$ESS_{k-means} = \sum_{j=1}^{k} \sum_{i=1}^{n} \left\| x_i^{(j)} - c_j \right\|^2 \tag{4.4}$$

The equation corresponds to an objective function which is an indicator for the distance of the *n* entities from their respective cluster centre with $\left\| x_i^{(j)} - c_j \right\|$ as the selected distance measure between an entity, $x_i^{(j)}$, and the cluster centre, c_j. Since the algorithm proves to be significantly sensitive to the initially randomly selected cluster centres, the k-means method will not necessarily yield an optimal configuration with regard to the global objective function minimum. In order to compensate for this effect, the k-means method usually is reapplied several times (Everitt, 1998, p. 178).

Even though there are no completely satisfactory methods for ex ante determining the number of clusters for any type of cluster analysis (Everitt, 1979, p. 170), three different statistics are computed from the set of pan-European observations in order to estimate the number of existing clusters (Cavicchi et al., 2005, p. 13). These statistics comprise the *pseudo F statistic*,

the *pseudo t^2 statistic* and the *cubic clustering criterion* (CCC).[74] A consensus among these statistics, i.e. local peaks of the pseudo *F* statistic and the cubic clustering criterion combined with a small value of the pseudo t^2 statistic indicate the achievement of an appropriate number of clusters (Cooper and Milligan, 1988, p. 325).[75]

In the following, both the Ward and the k-means method have been applied to the data set.[76] Given that the k-means method can only be applied to an ex ante defined number of clusters, different parameter constellations were repeatedly analysed (Cavicchi et al., 2005, p. 8). Whilst the Ward method suggests categorising the observations into *five* clusters, the cubic clustering criterion and the pseudo F statistic within the k-means method have local peaks with *three* and *four* clusters, respectively, as illustrated in table 4.22.[77]

Table 4.22 Number of Population Clusters according to the Ward and k-means method

	Ward method	**k-means method**				
Number of clusters	5	2	3	4	5	6
pseudo *F* statistic	205	296.86	301.95	307.79	301.43	308.23
pseudo t^2 statistic	138					
CCC	-38	-6.68	-9.17	-11.84	-17.65	-21.65

Source: Modified from Cavicchi et al., 2005, p. 13.

In consideration of these inconsistent findings, an additional, hierarchical and non-parametric method based on probability density estimation was conducted (Cavicchi et al., 2005, p. 8).[78] This method is based on the *k*-th nearest neighbour density estimate and hence varies according to the value of *k* which indicates an entity's number of neighbours and is generally defined as

$$k = 2\log_2 N\,. \tag{4.5}$$

74 In two independent studies, Milligan and Cooper (1985) and Cooper and Milligan (1988) compared thirty different methods for estimating the number of clusters. The three criteria that performed best in the simulations with a high degree of error in the data were the pseudo *F* and pseudo t^2 statistics, and the cubic clustering criterion. Duda and Hart (1973) developed a statistic which later was transformed into a pseudo t^2 statistic. The pseudo *F* statistic was developed by Calinski and Harabasz (1974). The cubic clustering criterion, finally, was developed by Sarle (1983) in order to tests hypotheses and hence estimate the number of clusters.

75 Even though the pseudo *F* and t^2 statistics may be useful indicators of the number of clusters, they are *not* distributed as *F* and t^2 random variables (Everitt and Dunn, 2001, p. 223). Moreover, these criteria are only appropriate for compact or slightly elongated clusters, preferably those that are approximately multivariate normal.

76 A total number of 1,958 valid observations was considered in this stage of the analysis.

77 Cavicchi et al. (2005, p. 12) present a capacious paper on performing the segmentation analysis on the data set.

78 The method is implemented in the CLUSTER application of the SAS software.

The corresponding values are denoted in table 4.23. As in the case of the k-means method, local peaks of the cubic clustering criterion and the pseudo F statistic combined with a small value of the pseudo t^2 statistic suggest categorising the observations into three clusters.

Table 4.23 Number of Population Clusters according to CLUSTER

	CLUSTER			
k	20	21	22	23
Number of clusters	4	4	3	2
pseudo *F* statistic	7.9	8.0	8.2	9.2
pseudo t^2 statistic	5.2	6.3	7.4	7.1
CCC	-80	-72	-65	-48

Source: Modified from Cavicchi et al., 2005, p. 13.

Comprising the miscellaneous findings, two of the featured methods independently suggest categorising the observations into *three* clusters. Consequently, this result will be the basis of any further analysis such as the actual segmentation. Taking into consideration that the number of clusters has been determined a priori, the continuative cluster analysis can be conducted following the k-means approach (Cavicchi et. al., 2005, p. 13). Table 4.24 reports the results after 25 iterations.[79]

Table 4.24 Categorisation of clusters according to the k-means method

	Clusters	**1**	**2**	**3**
		Non Trusters	Sceptic-Trusters	Trusters
Trust in media	Mean	-0.3854	0.2377	0.0665
	Std. Deviation	1.0436	0.9323	0.9534
Trust in food chain actors	Mean	-0.0851	-0.9419	0.6731
	Std. Deviation	0.8236	0.7940	0.6226
Trust in independent sources	Mean	-1.2473	0.5569	0.3556
	Std. Deviation	0.8194	0.6838	0.5554
Trust in alternative sources	Mean	-0.1691	-0.1791	0.2168
	Std. Deviation	1.1450	1.1027	0.7707
Trust in vested interests	Mean	-0.1054	-0.3244	0.2760
	Std. Deviation	1.0339	0.9284	0.9493

Note: Std. Deviation indicates the value's standard deviation.
Source: Modified from Cavicchi et al., 2005, p. 14.

As the exclusively negative mean values reveal, the first cluster consists of consumers who distrust *all* sources of information. Surprisingly, particular distrust is expressed towards independent sources, among them university scientists, national and European food safety authorities, governments, and medics. Consequently, this cluster, which, according to table

[79] With respect to table 4.24, it has to be remarked that the explanatory power is affected through the relatively high values of the respective standard deviations.

4.25 consists of 507 respondents (25.9% of the valid responses), will in the following be termed *non-trusters*. The country-specific share of non-trusters appears to be above average in the United Kingdom (32.2%) whereas it is relatively low in the Netherlands (15.9%).
The second cluster is characterised through distrust in food chain actors and vested interests, and, even though to a lesser extent, in alternative sources. Both media and independent sources, in contrast, are regarded as trustworthy sources of information. As a result of this inconsistent pattern, this cluster, which, according to table 4.25 comprises 578 respondents (29.5% of the valid responses), will in the following be referred to as *sceptic trusters*. The size of the cluster, which on average accounts for 29.5 percent of a country's respondents, varies from 40.3 percent in the Netherlands to 19.1 percent in the United Kingdom.
With respect to its exclusively positive values, the third cluster, finally, can be characterised through general trust in *all* sources of information with particular emphasis on trust towards food chain actors. Therefore, this cluster will in the following be termed *trusters*. According to table 4.25, the cluster amounts to 873 counts (44.6% of the valid responses) and thus clearly exceeds the size of the other clusters. The size of the cluster, which on average accounts for 44.6 percent of a country's respondents, varies from 40.8 percent in Italy to 50.0 percent in France. Still, this cluster seems to be reasonably well balanced since every country accounts for approximately twenty percent of the cluster's pan-European size despite differences in the number of valid responses.

As illustrated in figure 4.3, the respondents' categorisation into different population clusters appears to be relatively uneven considering the respective shares of non trusters, sceptic trusters and trusters per country.

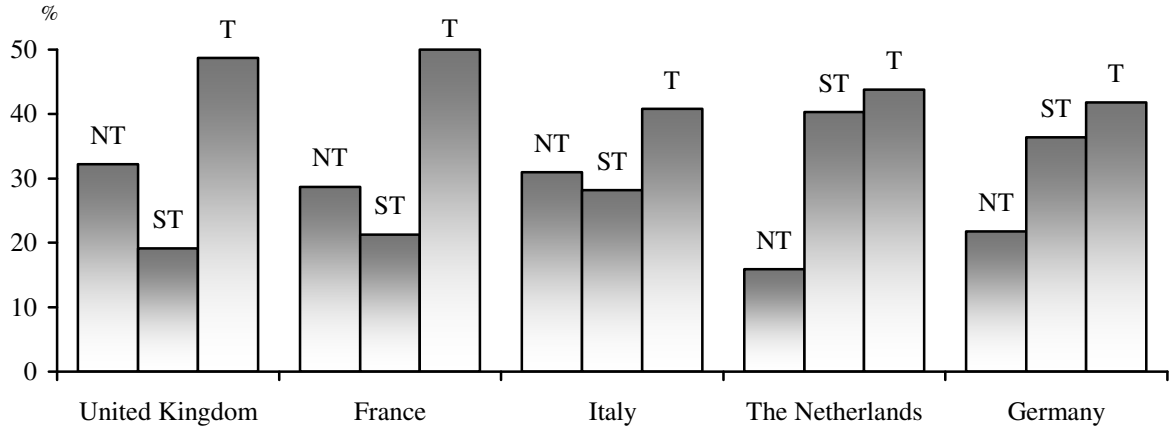


Figure 4.3 Share of Non Trusters (NT), Sceptic-Trusters (ST), and Trusters (T) per country (in percent)

Table 4.25 Composition of clusters per country

United Kingdom	Clusters			Total
	1	2	3	
Absolute Count	111	66	168	345
Percent of Country	32.2	19.1	48.7	100
Percent of Cluster	21.9	11.4	19.2	n/a
Percent of Survey	5.7	3.4	8.6	17.6
France				
Absolute Count	98	73	171	342
Percent of Country	28.7	21.3	50.0	100
Percent of Cluster	19.3	12.6	19.6	n/a
Percent of Survey	5.0	3.7	8.7	17.5
Italy				
Absolute Count	145	132	191	468
Percent of Country	31.0	28.2	40.8	100
Percent of Cluster	28.6	22.8	21.9	n/a
Percent of Survey	7.4	6.7	9.8	23.9
Netherlands				
Absolute Count	59	150	163	372
Percent of Country	15.9	40.3	43.8	100
Percent of Cluster	11.6	26.0	18.7	n/a
Percent of Survey	3.0	7.7	8.3	19.0
Germany				
Absolute Count	94	157	180	431
Percent of Country	21.8	36.4	41.8	100
Percent of Cluster	18.5	27.2	20.6	n/a
Percent of Survey	4.8	8.0	9.2	22.0
Total				
Absolute Count	507	578	873	1958
Percent of Country	25.9	29.5	44.6	100
Percent of Cluster	100	100	100	n/a
Percent of Survey	25.9	29.5	44.6	100

Source: Modified from Cavicchi et al., 2005, p. 15.

In a succeeding step, the composition of the above determined clusters is investigated with regard to socio-demographic characteristics like marital status, education, and status of employment as illustrated in table 4.26 (Cavicchi et al., 2005, p. 24). Interestingly, most characteristics appear to be reasonably well balanced across the different clusters.

Table 4.26 Composition of clusters according to socio-demographic characteristics (in percent)

		Clusters			Average
		1	2	3	
Marital Status	Single	25.6	28.3	27.7	27.3
	Married	62.0	60.5	60.9	61.1
	Other	12.4	11.2	11.4	11.6
Level of Education	no formal	4.8	2.3	2.8	3.1
	Primary school	9.3	6.1	8.6	8.0
	Lower secondary	26.6	25.6	24.3	25.3
	Higher	32.8	31.1	35.9	33.7
	Tertiary	13.7	17.6	18.1	16.8
	University	12.7	17.4	10.4	13.1
Status of Employment	Unemployed	4.6	2.5	5.2	4.2
	Student	5.8	6.3	4.7	5.5
	Household Keeper	14.8	12.9	11.9	12.9
	Retired	18.0	11.1	14.6	14.4
	Employed part time	16.0	18.8	18.8	18.1
	Employed full time	40.9	48.4	44.7	44.8
Current Occupation	Not employed	26.7	16.7	21.9	21.5
	Manual employee	14.3	12.2	13.9	13.8
	Farmer	2.1	0.9	1.0	1.2
	Non-manual	38.1	44.2	41.0	41.2
	Executive	7.4	11.4	11.0	10.2
	Self employed	9.8	10.9	8.2	9.4
	entrepreneur	1.6	3.6	3.0	2.9
Weekly, average expenditures on food (in euro)	< 45	11.6	9.5	9.5	10.0
	45-74.99	31.6	29.1	33.8	31.8
	75-119.99	30.8	27.7	27.9	28.6
	120-150	17.3	19.9	19.1	18.9
	> 150	8.6	13.8	9.7	10.6
Gross annual household income (in euro)	< 15,000	20.1	14.9	20.2	18.6
	15,000-29,999	31.1	32.4	34.4	33.0
	30,000-44,999	21.5	23.4	19.3	21.1
	45,000-59,999	13.7	12.9	15.4	14.3
	60,000-89,999	9.6	10.7	7.6	9.0
	90,000-120,000	2.3	3.4	2.2	2.6
	> 120,000	1.7	2.2	0.8	1.4
Country	United Kingdom	21.9	11.4	19.2	17.6
	France	19.3	12.6	19.6	17.5
	Italy	28.6	22.8	21.9	23.9
	Netherlands	11.6	26.0	18.7	19.0
	Germany	18.5	27.2	20.6	22.0

Source: Modified from Cavicchi et al., 2005, p. 24.

The respondents' marital status, for example, varies only insignificantly with the share of singles amounting to an average of 27.3 percent and with a minimum of 25.6 percent in cluster one and a maximum of 28.3 percent in cluster two. The share of married respondents,

which on average amounts to 61.1 percent, vacillates even less – from a maximum of 62.0 percent in the first cluster to a minimum of 60.5 percent in the second cluster.

With some reservations, the balance of certain characteristics also holds for the respondents' level of education. Still, it needs to be remarked that the share of respondents in the first cluster that have completed a tertiary education (13.7%) is clearly below average (16.8%). Furthermore, the share of academics in the second cluster (17.4%) clearly exceeds the average value of 13.1 percent. Interestingly, the contrast holds true for both unemployed (2.5%) and retired respondents (11.1%) whose shares in the second cluster evidently are below the average of 4.2 percent and 14.4 percent, respectively. All other characteristics of the respondents' status of employment and their current occupation seem to be evenly distributed. Regarding the average amount spent on the purchase of comestibles, the share of respondents that spend more than 150 euro weekly (13.8%) clearly is above average (10.6%) in the second cluster but well-balanced, otherwise. This also holds true for the consumers' income classes that appear to be evenly distributed across the three clusters. With respect to the country-specific composition of the clusters, Italian respondents interestingly account for 28.6 percent of all consumers assigned to the first cluster. Accordingly, they appear to be particularly distrusting in any source providing information about food safety. Moreover, the share of British (11.4%) and French (12.6%) respondents within the second cluster, i.e. the sceptic trusters, is below average (17.6% and 17.5%, respectively) whereas in the Netherlands (26.0%) and Germany (27.2%) these shares are above average (19.0% and 22.0%, respectively). Combined, the Dutch and German share accounts for 53.2 percent of the respondents assigned to the second cluster.

Even though only selected results are necessary for the first stage of estimating a model illustrating the consumers' intention to purchase, the above analysis of 2,725 pan-European observations and findings attributed to a segmentation analysis allow for an extensive impression of consumer behaviour under uncertainty. In the subsequent subchapter, these results will provide a basis for identifying the factors of influence determining the consumers' intention to purchase.

4.4 The SPARTA Model

The integration of perceived risk and trust into the framework of the Theory of Planned Behaviour and the likewise consideration of the influence of different individual characteristics have resulted in the development of the SPARTA model.[80] The acronym SPARTA is derived from the initials of the global variables which are assumed to determine the consumer's behavioural intentions. According to equation 3.46, these variables comprise the subjective norm, SN, the perceived behavioural control, PBC, the behavioural attitude, A_B, the perceived risk, PR, trust, T, and socio-demographic variables which are summarised to alia, A_L. The hypothesised interaction between the variables as illustrated in figure 4.4 will be tested statistically within the SPARTA framework.

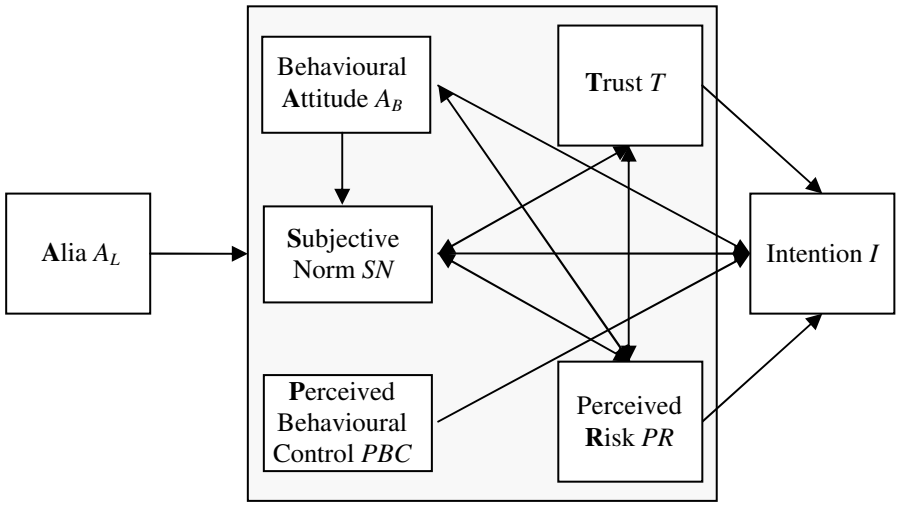


Figure 4.4 The SPARTA Model

Since figure 4.4 mainly is an advancement of the extended Theory of Planned Behaviour illustrated in figure 3.12, certain parallels such as the level of interaction among the global variables are obvious. These will be thoroughly discussed in the following section.

4.4.1 Modelling Behavioural Intention and Socio-Demographic Factors

In a first step, the classical components of the Theory of Planned Behaviour, Behavioural Attitude, A_B, Subjective Norm, SN, and Perceived Behavioural Control, PBC, are derived following an expectancy-value formulation. The global variables are assumed to be proportional to a linear combination of the respondents' respective specific beliefs, i.e. to

[80] The SPARTA model was developed in close cooperation with Mazzocchi et al. (2005a) within the scope of the European Commission's TRUST Food Risk communication and Consumer's Trust in the Food Supply Chain Project.

behavioural, normative, and to control beliefs, contributing to the global variables with weights that depend on the motivation to comply with normative beliefs, the power of control beliefs, and with the outcome evaluation of behavioural beliefs. Formally, this relationship is expressed in equations 3.39, 3.40, and 3.42, respectively. The measurement of the parameters and their adjacent introduction into the formulae yields an indirect measure of the global variables. Correlations between a direct measure of the global variables and their expectancy-value formulation provide a measure of consistency.

The global attitude variable, however, was assessed in two manners, first by applying the expectancy-value formulation as illustrated in equation 3.39 to fourteen different beliefs elicited through the questionnaire, and, second, by applying equation 3.39 to solely the beliefs identified as salient by each respondent.[81] A comparison between the indirect measures obtained through the application of the above steps yields an empirical assessment regarding the saliency of beliefs (Mazzocchi et al., 2005a, p. 8).

In contrast to the classical determinants of the Theory of Planned Behaviour, perceived risk, PR, as illustrated in equation 3.45, was assessed as a squared root weighed average of nine different measures of specific risk factors, r_i, with weights determined through the knowledge of each risk factor, β_i, as indicated by the respondents in question 17, 18, and 22. All risk factors, β_i, were related to the consumption of chicken and the respondent's knowledge of respective risks in the short as in the long run.[82]

Considering the notion of trust, *T*, however, emphasis needs to be placed on the circumstance that it is no longer considered an unidimensional measure. According to table 4.18, trust in information needs a different specification since it is expected to vary across the specified 24 different sources of information. Moreover, the impact of trust in information from dissimilar sources like media or food chain actors, for instance, is likely to have a very different impact on behavioural intention. Thus, the identification of the latent trust determinants is performed by collecting measures of trust in information provided by n different sources – as illustrated in question 43 – followed by a principal components analysis. As a result, five components of trust that still preserve the required differentiation were identified. With regard to these components and to equation 3.44, the concept of trust is marginally modified to

[81] In this step of the analysis, the number of beliefs identified as salient by the respondents was limited to a maximum of three different beliefs.

[82] Risk factors in the short run predominantly featured the issue of food poisoning, whereas risk factors in the long term were mostly related to the respondents' diet.

$$T_j = \sum_{i=1}^{n} \alpha_{ji}\, t_i \quad \text{with} \quad j = 1, ..., J\,, \tag{4.6}$$

with t_i as the specific trust determinants, α_{ji} as the respective factor loadings for the *j*-th principal component, T_j as the *j*-th principal component score, and *J* as the identified number of components, i.e. the number of trust determinants. In order to assess the individual overall inclination to trust in food safety information independently from the source, the average of the *J* selected components can be determined through

$$T = \frac{1}{J} \sum_{j=1}^{J} T_j\,. \tag{4.7}$$

Following the estimation of the global variables, their interaction is analysed in a succeeding step. As illustrated in figure 4.4, a number of endogenous relationships has to be considered when estimating the interaction between parameters, particularly considering that perceived risk and trust might prove to be partly interdependent to the other components of the consumer's intention to conduct a certain behaviour (Mazzocchi et al., 2005a, p. 5).[83] Hence, as previously stated in equation 3.46, the system of simultaneous equations appears to be a suitable method for modelling the endogenous relationships.[84] Based on equation 3.46, the generic system is modified to

$$\left.\begin{aligned} T &= f(SN) \\ PR &= f(T_j) \\ SN &= f(A_B, T_j) \\ A_B &= f(PR) \end{aligned}\right\} \tag{4.8}$$

with $j = 1, ..., J$. Regarding equation 4.8, trust, T, and perceived risk, PR, are determined endogenously as the subjective norm, SN, both influences and is influenced by the overall level of trust in food safety information, T, whilst the perceived risk, PR, influences the behavioural attitude, A_B, towards the food and is determined through the allocation of trust

83 Perceived risk, for example, might also be understood as an evaluation towards a specific product attribute and thus a behavioural belief.

84 In accordance with equation 3.46, the consumer's perceived behavioural control is not further considered since it is assumed to be an exogenously determined parameter.

across the different sources, T_j. The overall degree of trust, T, is *endogenous*, whereas the specific levels of trust in food safety information provided by different sources, T_j, are assumed to be *exogenous* in this stage of the analysis (Mazzocchi et al., 2005a, p. 6).

Following the above description of the relationships depicted in figure 4.4, the consumer's intention to conduct a particular behaviour can now be expressed as a linear combination of the global variables

$$I_B = \beta_0 + \beta_1 SN + \beta_2 PBC + \beta_3 A_B + \beta_4 PR + \sum_{j=i}^{J} \lambda_j T_j \qquad (4.9)$$

with $\beta_i \ (i = 1,...,4)$ as the individual weight of each determinant. The estimation of equation 4.9 can be conducted conditional to the socio-demographic variables, A_L, as a parameter shifter, by allowing the model parameters to vary according to the intensity of a set of characteristics. The statistical significance of the coefficients of any parameter shifter indicates both the extent and direction in which socio-demographic characteristics can determine differences in the weight of the global variables in relation to behavioural intentions. Formally, if socio-demographic differences are assumed to affect *all* components in the SPARTA model, equation (4.9) has to be modified to

$$\begin{aligned} I_B = &\left(\beta_0 + \sum_{i=1}^{d} \gamma_{0i} D_i\right) + \left(\beta_1 + \sum_{i=1}^{d} \gamma_{1i} D_i\right) SN + \left(\beta_2 + \sum_{i=1}^{d} \gamma_{2i} D_i\right) PBC + \\ &\left(\beta_3 + \sum_{i=1}^{d} \gamma_{3i} D_i\right) A_B + \left(\beta_4 + \sum_{i=1}^{d} \gamma_{4i} D_i\right) PR + \sum_{j=1}^{J} \left(\lambda_j + \sum_{i=1}^{d} \gamma_{5i} D_i\right) T_j \end{aligned} \qquad (4.10)$$

with $\beta_i \ (i = 1,...,4)$ as the individual weight of each determinant, γ_i as the parameter shifter associated with the demographic factor, D_i, and the latter as the *i*-th socio-demographic variable (Mazzocchi et al., 2005b, p. 6).[85]

[85] The parameter shifter γ_i indicates the extent to which β_i changes according to different socio-demographic clusters.

4.4.2 Methods of Estimation

Applied studies based on the Theory of Planned Behaviour have deployed a variety of different methods for estimating the relationship between the consumer's behavioural intention and latter's determinants. With regard to censored data, literature relies on *structural equation modelling* (Conner et al., 2003; Kalafatis et al., 1999) rather than on *multiple linear regressions* (Povey et al., 2000; Shaw and Shiu, 2002; Tonglet, 2001) or *tobit regressions* (Lynne et al., 1995). Besides, the estimate of a Theory of Planned Behaviour model can be based on an *ordered discrete choice model* as has recently been shown (Cook et al., 2002).

Despite the diversity of methods illustrated above, the SPARTA model as described in equations 4.9 and 4.10 will in the following be estimated by means of an *ordered probit model* (Mazzocchi et al., 2005b, p. 7).[86] Considering that the dependent variable is *discrete*, *nominal*, and *ordered*, an ordered probit model allows for an estimation of the consumer's intention to conduct a particular behaviour according to equation 4.10 (Liao, 1994, p. 37). Ordered probit models can be classified as *discrete choice probability models* which are often applied to the analysis of consumers' attitudes, behaviours, and choices, and the likelihood of their respective occurrences. Regarding these inherently ordered variables of multinomial choice, multinomial logit or probit models fail to account for the ordinal nature of the dependent variables even though their outcome is discrete. The ordered probit model is estimated according to the *Broyden-Fletcher-Goldfarb-Shannon maximum likelihood algorithm* which yields the estimates of the coefficient for the ordinal probit equation.[87] These coefficients correspond to the relative weight of each of the five determinants of the consumer's intention to conduct a particular behaviour. Furthermore, this modus operandi yields a table of marginal effects which measure the change in probability for a given value of the dependent variable induced by a unit change in one of the determinants.[88]

As previously denoted, both a system of simultaneous equations and a principal components analysis have been applied to the SPARTA model in addition to the ordered probit model. With respect to the evident endogeneity among the dependent variables as depicted in

[86] For the purpose illustrated above, an ordinary linear regression appears to be inappropriate because of the noninterval nature of the dependent variable – the spacing of the outcome choices cannot be assumed to be uniform (Liao, 1994, p. 37). Standard multiple regression is not applicable since the respondent's behavioural intentions are assessed through a seven point Likert scale.

[87] The *Broyden-Fletcher-Goldfarb-Shannon maximum likelihood algorithm* was applied to the ordered probit model as part of the *LimDep* statistical software package.

[88] Greene (2003, p. 736) provides a detailed discussion featuring the concept of ordered probit models.

equation 4.8, a system of simultaneous equations is indispensable for the method of resolution.[89] Hence, a consistent and asymptotically efficient estimator for the coefficients in equation 4.8 is provided by a three-stage least squares approach (Mazzocchi et al., 2005b, p. 7). The principal components analysis as illustrated in section 4.3, finally, is indispensable for obtaining the components of trust as illustrated in equation 4.6.

4.4.3 Results of the Estimation of the Global Variables

In an adjacent step, the estimated global determinants, i.e. the subjective norm, SN, the perceived behavioural control, PBC, the behavioural and salient attitudes, A_B and A_S, and the perceived risk, PR, are compared to the directly collected measures. This, however, is not applicable for the components of the respondents' overall trust in food safety information, T, since those factors cannot be elicited directly. Moreover, table 4.27 depicts the components' mean values, their standard deviations, and their correlations with different behavioural intentions. The behavioural intentions considered comprise the respondent's intention to purchase chicken under common circumstances in the week following the interview, ITP_1, and their intention to purchase chicken subject to information about a hypothesised salmonella incidence, ITP_2.

As a preliminary remark concerning the interpretation of table 4.27, it seems worth mentioning that the respondents' average value of perceived risk regarding the consumption of chicken is clearly below the neutral value of four.[90] This supports the previous assumption that consumers usually perceive the risks associated with the consumption of chicken – both in the short and in the long term – as being negligible.

Comparing the measures of the expectancy-value formulation of the global variables to their direct measures, the obtained level of consistency seems to be acceptable with similar average values and highly significant correlations ranging from 0.67 for subjective norm, *SN*, to 0.28 for perceived risk, *PR*. With respect to table 4.27, the enhancement of behavioural attitudes through the circumscribed introduction of saliency is apparently of only little explanatory power. Even though this step yields nearly identical mean values of 5.42 versus 5.94 in the

89 Note that the system of simultaneous equations needs to satisfy the order and rank conditions which ensure proper identification.

90 Both variables and principal components were processed in a manner such that low values correspond to negative answers from the respondents whereas high values correspond to positive answers.

expectancy-value formulation and twice 5.74 in the direct measure, the increase in the level of correlation from 0.54 to 0.57 turns out to be marginal, at most.

Table 4.27 Mean measures and Pearson Correlation

Variable		Mean Indirect Measure		Mean Direct Measure		Correlations		
						D-I	ITP_1	ITP_2
SN	Subjective Norm	3.33	(1.37)	2.81	(1.85)	0.67***	0.07***	0.07***
PBC	Perceived Behavioural Control	3.76	(1.15)	2.40	(1.59)	0.42***	0.11***	0.05***
A_B	Attitude	5.42	(0.68)	5.74	(1.50)	0.54***	0.30***	0.13***
A_S	Salient Attitudes	5.94	(0.97)	5.74	(1.50)	0.57***	0.27***	0.15***
PR	Perceived Risk	2.60	(1.43)	2.85	(1.38)	0.28***	-0.06***	-0.12***
T_M	Trust (Media)	0.00	(1.00)				-0.01	-0.04*
T_F	Trust (Food Chain Actors)	0.00	(1.00)				0.09***	0.07***
T_I	Trust (Independent Sources)	0.00	(1.00)				0.05**	0.00
T_A	Trust (Alternative Sources)	0.00	(1.00)				0.00	-0.10***
T_V	Trust (Vested Interests)	0.00	(1.00)				0.00	0.04
T	Trust (Overall)	0.00	(0.45)				0.07***	-0.01

Note: The variables *SN*, *PBC*, A_B, A_S, and *PR* have been ranked on a seven point scale according to their relevance. The trust component scores T_I and the overall trust in food safety information, *T*, has been standardised across the sample. Standard deviations are put in parentheses. The acronym *ITP* represents the respondents' intention to purchase chicken both under common circumstances, ITP_1, and following a hypothetical salmonella incidence, ITP_2. *D-I* refers to the correlation between the direct and indirect measurements. The values' standard deviations are put in parentheses with *** indicating significance at the one percent level, ** indicating significance at the five percent level, and * indicating significance at the ten percent level. Source: Modified from Mazzocchi et al., 2005b, p. 10.

Regarding the invariably highly significant correlations between the global variables and the respondents' intention to purchase chicken under common circumstances in the week following the interview, ITP_1, particularly behavioural attitude, A_B, and, to a lesser extent, perceived behavioural control, *PBC*, and subjective norm, *SN*, are positively correlated to ITP_1 and thus have a positive effect on the respondents' likelihood to purchase chicken. This also accounts for the respondents' highly significant trust in food safety information provided by food chain actors and independent sources. Since the consumers' overall level of trust, *T*, is also highly significant and positively related to ITP_1, it can be assumed that under common circumstances trust in food safety information positively influences the respondents' intention to purchase chicken. With a statistically highly significant value of -0.06, a high level of perceived risk, in contrast, negatively affects the respondents' intention to purchase chicken.

Following the explicit consideration of ITP_2, i.e. the consumers' intention to purchase chicken in the environment of a hypothesised salmonella incidence, all positive components but subjective norm, *SN*, forfeit their impact as expected. Still, their values remain statistically highly significant. Moreover, components such as perceived risk, for instance, negatively

influence the respondents' intention to purchase chicken, now to a greater extent than compared to ITP_1.

This also holds true for the consumers' trust in food safety information provided by media and for their trust in alternative sources (Mazzocchi et al., 2005b, p. 10).

In addition to the above findings, table 4.28 presents the mean values of the SPARTA model's global variables as classified per country. Performing a *F-test* yields that all global variables differ in a statistically highly significant manner.

According to table 4.28, the largest differences occur in the consumers' perceived behavioural control, *PBC*, which appears to be significantly higher in the Netherlands (4.41) and the United Kingdom (4.08) than the pan-European average (3.76).[91] This also accounts for the consumers' perceived risk, *PR*, which continuously remains below the neutral value of four but ranges from 3.48 in Germany to 1.88 in the United Kingdom. The subjective norm, *SN*, also continuously below the neutral value of four, appears to be relatively high in the United Kingdom (3.85) and Italy (3.66) compared to a value of 2.62 in the Netherlands. Finally, the consumers' salient attitudes towards the behaviour in question, A_S, obtain high values between 6.14 in the United Kingdom, 6.06 in Italy, and 5.60 in Germany, respectively.

Table 4.28 Mean values and standard deviations of behavioural determinants per country

Variable		F-test	EU	UK	FRA	ITA	NED	GER
SN	Subjective Norm	82.3***	3.33 (1.37)	3.85 (1.44)	3.01 (1.17)	3.66 (1.43)	2.62 (0.99)	3.54 (1.42)
PBC	Perceived Behavioural Control	108.3***	3.76 (1.15)	4.08 (1.06)	3.22 (1.17)	3.51 (1.05)	4.41 (0.96)	3.69 (1.08)
A_S	Salient Attitudes	25.5***	5.94 (0.97)	6.14 (0.94)	6.00 (0.90)	6.06 (0.82)	5.82 (0.97)	5.60 (1.13)
PR	Perceived Risk	87.9***	2.60 (1.43)	1.88 (1.21)	2.36 (1.34)	2.62 (1.39)	2.77 (1.36)	3.48 (1.40)
T_M	Trust (Media)	10.3***	0.00 (1.00)	-0.11 (1.01)	0.04 (1.14)	-0.17 (1.08)	0.02 (0.81)	0.23 (0.88)
T_F	Trust (Food Chain Actors)	22.1***	0.00 (1.00)	0.19 (0.96)	0.35 (1.09)	-0.08 (0.95)	-0.18 (0.95)	-0.19 (0.96)
T_I	Trust (Independent Sources)	13.6***	0.00 (1.00)	-0.22 (0.91)	-0.17 (1.17)	0.04 (1.09)	0.26 (0.88)	0.03 (0.84)
T_A	Trust (Alternative Sources)	28.0***	0.00 (1.00)	-0.15 (0.94)	0.14 (1.05)	-0.16 (1.03)	-0.23 (1.02)	0.37 (0.83)
T_V	Trust (Vested Interests)	42.8***	0.00 (1.00)	0.21 (1.04)	-0.60 (1.11)	0.12 (0.99)	0.17 (0.72)	0.03 (0.91)
T	Trust (Overall)	7.6***	0.00 (0.45)	-0.01 (0.43)	-0.05 (0.51)	-0.05 (0.50)	0.01 (0.38)	0.10 (0.39)

Note: Standard deviations are put in parentheses. Regarding the asterisks, *** indicates significance at the one percent level, ** indicates significance at the five percent level, and * indicates statistical significance at the ten percent level. Source: Modified from Mazzocchi et al., 2005b, p. 11.

With respect to consumers' overall trust in food safety information, *T*, German respondents appear to be the most trusting with a value of 0.10, whilst French and Italian respondents with values of -0.05 each are the least trusting as illustrated in table 4.28. Information provided by

[91] Regarding table 4.28, it needs to be remarked that the explanatory power is generally affected through the relatively high values of the respective standard deviations.

media, T_M, is considered particularly trustworthy by German respondents (0.23), whereas it is least trusted by Italian consumers (-0.17). Trust in food chain actors, T_F, is relatively high in France (0.35) and the United Kingdom (0.19) compared to the Netherlands (-0.18) or Germany (-0.19). Interestingly, trust in information provided by independent sources, T_I, and by alternative sources, T_A, appears to be in opposition. Whilst Dutch respondents (0.26) seem to trust information from independent sources – in contrast to the British consumers (-0.22) – this does not hold for information from alternative sources (-0.23), which German respondents (0.37) obviously consider trustworthy. Information from vested interests, finally, are less trusted in France (-0.60) than in the United Kingdom (0.21) or the Netherlands (0.17).

4.4.4 Statistical interaction among the global variables

According to the graphical presentation of the SPARTA model as illustrated in figure 4.4, some of the global variables elaborately analysed in the previous subchapter indubitably appear to be interrelated. These nexuses hypothesised in figure 4.4 are formally expressed in equation 4.8 which has been subject to a three-stage least squares (3SLS) estimation.[92] The corresponding results are summarised in table 4.29.

Interestingly, nearly all hypothesised nexuses prove to be statistically significant. The consumers' perceived behavioural control, *PBC*, is not taken into consideration since it is determined exogenously and thus exhibits no interaction with the global variables as previously alluded. According to the findings displayed in table 4.29, the consumers' perception of contingent social pressures, i.e. his subjective norm, *SN*, is apparently positively correlated in a statistically highly significant manner to his behavioural attitudes, A_B, (0.57) and to each of the five components of the overall level of trust in food safety information. The consumers' attitude towards conducting the behaviour in question, in turn, is negatively influenced in a statistically highly significant manner through the perceived risk, *PR*. Compared to the pan-European value (-0.20), however, the negative impact of perceived risk on the consumers' behavioural attitude is below average in the United Kingdom (-0.07) and Italy (-0.09). Perceived risk, *PR*, again, strongly varies with respect to the source providing information about food safety.

[92] The *three-stage least squares estimation* (3SLS) as proposed by Zellner and Theill (1962, p. 57) consists of a *two-stage least squares* (2SLS) estimation – which is the most common method used for estimating simultaneous-equation models – followed by a *seemingly unrelated regression* (SUR) estimate (Greene, 2003, p. 405). The SUR as proposed in Zellner, (1962, p. 503) comprises the calculation of a covariance matrix followed by a *generalised least squares* (GLS) estimation.

Table 4.29 Statistical interaction among the global variables

	Subjective Norm	**EU**	**UK**	**FRA**	**ITA**	**NED**	**GER**
	Constant	0.00	0.00	0.00	0.00	0.00	0.00
A_B	Attitude	0.57***	0.63***	0.51***	0.59***	0.46***	0.60***
T_M	Trust (Media)	0.28***	0.33***	0.20***	0.24***	0.31***	0.45***
T_F	Trust (Food Chain)	0.17***	0.00***	0.14***	0.00	0.22***	0.34***
T_I	Trust (Independent)	0.15***	0.25***	0.21***	0.23***	0.28***	0.00
T_A	Trust (Alternative)	0.31***	0.00***	0.22***	0.16***	0.34***	0.40***
T_V	Trust (Vested Interest)	0.37***	0.48***	0.26***	0.50***	0.35***	0.35***
	Attitude						
	Constant	6.43***	6.25***	6.49***	6.30***	6.36***	6.30***
PR	Perceived Risk	-0.20***	-0.07*	-0.21***	-0.09***	-0.21***	-0.21***
	Perceived Risk						
	Constant	2.70***	2.01***	2.52***	2.58***	2.79***	3.42***
T_M	Trust (Media)	0.00	0.22***	0.00	-0.25***	0.00	0.00
T_F	Trust (Food Chain)	-0.26***	0.00	-0.35***	-0.30***	0.00	0.00
T_I	Trust (Independent)	-0.07**	0.00	-0.12***	0.00	0.00	-0.18**
T_A	Trust (Alternative)	0.19**	0.24***	0.16***	-0.11*	0.29***	0.20**
T_V	Trust (Vested Interest)	0.26***	0.00	0.10*	0.00	0.00	-0.15*
	Trust in Food Safety Information						
	Constant	-0.66***	-0.65***	-1.20***	-0.77***	-0.86***	-0.46***
SN	Subjective Norm	0.20***	0.16***	0.39***	0.20***	0.32	0.16***

Note: Asterisks such as *** indicate significance at the one percent level, ** indicate significance at the five percent level, and * indicates significance at the ten percent level. Global variables are measured directly. Source: Modified from Mazzocchi et al., 2005b, p. 12.

Whilst trust in information about food safety provided by media, T_M, on average is neutral and not significant, the opposite holds for trust in information provided by alternative sources, T_A, (0.19) and, surprisingly, for trust in information provided by vested interests, T_V, (0.26). Consumers' trust in these sources increases their risk perception. Yet, trust in information about food safety provided by media, T_M, increases the perceived risk in the United Kingdom (0.22), whereas it is paradoxically reduced in Italy (-0.25). Whilst trust in information provided by alternative sources, T_A, increases the risk perception in all countries of the survey but in Italy (-0.11), trust in information provided by vested interests, T_V, decreases the perceived risk in Germany (-0.15). Surprisingly the opposite holds for France (0.10). Trust in information provided by food chain actors, T_F (-0.26) and independent sources, T_I, (-0.07), finally, reduces the consumers' perception of risk on average. Whilst a reduction of the risk perceived with regard to trust in information provided by food chain actors, T_F, is above average (-0.26) in France (-0.35) and Italy (-0.30), trust in independent sources, T_I, (-0.07) particularly reduces the risk perceived in Germany (-0.18) and France (-0.12), again.

4.4.5 Determinants of the Consumers' Intention to Purchase

Following the ascertainment of the statistical interaction among the SPARTA model's global variables, the following paragraphs will focus on the determinants of the consumers' intention to purchase chicken. Whilst in a first step emphasis is placed on the consumers' intention to purchase chicken in a standard situation, contingent changes attributed to the occurrence of a hypothetical salmonella incidence are investigated subsequently. Average values for the respective sample are denoted in table 4.30.[93]

Table 4.30 Determinants of the consumers' intention to purchase chicken in a standard situation

Determinants		EU	UK	FRA	ITA	NED	GER
	Constant	-1.37	1.13	-1.07	-2.19	-0.06	-0.54
SN	Subjective Norm	0.05	-0.02	-0.08	0.06	-0.02	0.09
PBC	Perceived Behavioural Control	0.13	0.23	0.18	0.00	-0.10	0.13
A_B	Behavioural Attitude	0.39	0.50	0.28	0.60	0.32	0.32
PR	Perceived Risk	0.00	-0.08	0.07	0.05	0.00	0.02
T_M	Trust in Media	-0.01	-0.16	-0.08	-0.02	0.12	0.08
T_F	Food Chain Actors	0.07	0.01	0.06	0.29	0.15	0.09
T_{FA}	Federal Authorities	0.00	-0.21	-0.09	0.00	-0.06	0.03
T_I	Independent Sources	0.02	-0.11	0.01	-0.07	0.07	0.04
T_A	Alternative Sources	-0.01	-0.16	0.01	0.17	0.08	-0.06

Source: Modified from Mazzocchi et al., 2005b, p. 15.

In a standard situation and disregarding all other determinants, the consumers' inclination to purchase chicken is slightly higher in the United Kingdom (1.13) and lower both in France (-1.07) and Italy (-2.19). With regard to the global variables, subjective norm, as illustrated above, only marginally influences the consumers' intention to purchase chicken, mostly irrespective of the respondents' home country. Yet, normative beliefs appear to be of marginal influence in Germany (0.09) where the opinions of the interviewees' social environment favour the purchase of chicken. Interestingly, the opposite holds for France (-0.08). As expected, this also holds for perceived risk, which appears to be of negligible impact in a standard situation. Only in the United Kingdom (-0.08), an increase in perceived risk has a marginally negative effect on the consumers' intention to purchase chicken. Even though being an exception, this also applies to the impact of perceived behavioural control in the Netherlands (-0.10). Generally, however, perceived behavioural control has a positive impact on the consumers' intention to purchase ranging from 0.23 in the United Kingdom and

[93] In an attempt to increase the model's explanatory power, an additional component featuring trust in federal authorities is separated from the principal component comprising trust in information provided by independent sources (Mazzocchi et al., 2005b, p. 14)

0.18 in France to 0.00 in Italy. Yet, the most important determinant of the consumers' intention to purchase chicken in a standard situation is behavioural attitude. Throughout the sample, it exhibits a positive impact, ranging from 0.60 in Italy and 0.50 in the United Kingdom to 0.28 in France. With regard to general trust in information, findings for the pan-European sample suggest an insignificant effect. This, however, does not apply for country-specific results. In the United Kingdom, for instance, trust in information provided by any source, appears to adversely affect the consumers' intention to purchase. This is substantiated particularly through trust in authorities (-0.21), media (-0.16), and, unexpectedly, through trust in independent sources (-0.11). In France, results mostly suggest a minor impact of trust in information on the consumers' intention to purchase chicken. Slight exceptions regarding the minor negative effect of trust in information provided by authorities (-0.09) and media (-0.08), however, occur. In Italy, trust in information provided by food chain actors (0.29) and alternative sources (0.17) positively affects the consumers' intention to purchase whereas trust in information provided by independent sources (-0.07) yields the opposite effect. In the Netherlands, both trust in information from media (0.12) and food chain actors (0.15) has a positive impact – as in Germany, even though to a lesser extent (0.08 and 0.09, respectively). With regard to the types of trust, it can be ascertained that trust in media has a negative affect in the United Kingdom (-0.16) and France (-0.08) but has a positive impact in the Netherlands (0.12) and Germany (0.08). This also applies for trust in information provided by independent and alternative sources, which negatively affects the consumers' intention to purchase in the United Kingdom (-0.11 and -0.16, respectively) but has a positive impact in the Netherlands (0.07 and 0.08, respectively). Trust in information provided by food chain actors, in contrast, generally shows a positive impact on the consumers' intention to purchase, ranging from 0.29 in Italy to 0.01 in the United Kingdom.

For reasons of clarity, the impact of socio-economic and socio-demographic characteristics on the global variables has not been integrated in table 4.30 but will be thoroughly elucidated in the following. The weight of subjective norm, *SN*, on the consumers' intention to purchase, for instance, increases in the United Kingdom as the respondents' income increases. In Italy, it increases if the household has children under the age of 16. The weight of behavioural attitude, A_B, increases both in the pan-European sample as in the Netherlands as the size of the respondents' hometown increases.[94] Attitudes gradually become less relevant in explaining

[94] Note that in addition to the low rate of response regarding the respondents' gross annual income in the Netherlands, another anomaly emerges from the variable featuring the size of the respondents' hometown. Whilst the percentage of respondents from smaller towns is statistically insignificant for Italy, no

the consumers' intention to purchase, in contrast, with a higher level of education both in France and Germany. The weight of risk perception, *PR*, interestingly, is controversially influenced in Italy. Its weight steadily increases with a larger hometown of the respondent but decreases with a higher level of education. Regarding the components of trust, the impact of socio-economic and socio-demographic characteristics appears to be distributed unevenly. Trust in food safety information provided by media, T_M, for example, is not subject to any of the effects discussed above whereas the weight of trust in information provided by food chain actors, T_F, becomes less relevant in explaining the consumers' intention to purchase with the respondents growing older in Italy. Paradoxically, this effect is reversed in France, where the weight of trust in food safety information provided by media, T_M, decreases with higher levels of both income and education. The impact of trust in information provided by independent sources, T_I, is positively correlated with the respondents' level of education, yet only in the United Kingdom. The weight of trust in alternative sources, T_A, finally, gradually becomes less relevant with the respondents growing older in the pan-European sample and in the United Kingdom, where a higher level of education additionally yields the same findings.

Unsurprisingly, the average values of the determinants influencing the consumers' intention to purchase chicken significantly change when the respondent is confronted with a hypothetical food safety incidence. Average values are denoted in table 4.31.

Table 4.31 Determinants of the consumers' intention to purchase chicken in the environment of a hypothetical salmonella outbreak

Determinants		EU	UK	FRA	ITA	NED	GER
	Constant	-0.82	-0.06	0.65	-1.10	1.16	-1.62
SN	Subjective Norm	0.05	-0.03	-0.08	0.18	0.02	0.03
PBC	Perceived Behavioural Control	0.04	-0.02	0.02	-0.05	0.53	0.13
A_B	Behavioural Attitude	0.17	0.16	0.00	0.19	0.28	0.30
PR	Perceived Risk	-0.08	-0.02	-0.16	-0.16	-0.08	-0.09
T_M	Trust in Media	-0.04	-0.13	-0.10	-0.13	-0.23	0.10
T_F	Trust in Food Chain Actors	0.02	0.02	0.18	0.08	0.01	0.10
T_{FA}	Trust in Federal Authorities	0.04	-0.13	-0.08	0.06	-0.27	0.24
T_I	Trust in Independent Sources	-0.02	0.02	0.04	-0.07	0.01	-0.10
T_A	Trust in Alternative Sources	-0.09	-0.07	-0.09	0.02	-0.06	-0.22

Source: Modified from Mazzocchi et al., 2005b, p. 16.

Compared to the previously elucidated standard situation, the impact of subjective norm on the consumers' intention to purchase remains mostly unchanged – except for Italy where an

respondents from towns with more than 100,000 inhabitants were selected in Germany. Results might thus be biased due to a reduced sample size.

increase in the positive impact (0.18) can be observed. The impact of perceived behavioural control, *PBC*, in contrast, has generally become less important with exception of the Netherlands where its previously negative impact has changed in sign and quintupled to 0.53. Behavioural attitudes, A_B, again, show a consistently positive effect on the intention to purchase even though it has become less important, varying from 0.30 in Germany to 0.00 in France. Ranging from 0.18 in France to 0.01 in the Netherlands, this also holds for the respondents' trust in information provided by food chain actors, T_F. As expected, perceived risk, *PR*, associated with the purchase of chicken has a negative impact on the intention to purchase throughout all countries, ranging from -0.16 in Italy and France to -0.02 in the United Kingdom. This also applies for the effect of trust in information provided by media, T_M, ranging from -0.23 in the Netherlands to -0.10 in France with Germany (0.10) being an exception. Moreover, varying from -0.22 in Germany to -0.06 in the Netherlands, it also holds for trust in information provided by alternative sources, T_A, except for Italy (0.02). The impact of trust in information provided by independent sources, T_I, finally, is mostly negligible. Only in Germany (-0.10) and Italy (-0.07) a significantly negative impact can be observed.

After the occurrence of a hypothetical salmonella incidence, the impact of socio-economic and socio-demographic characteristics on the global variables has significantly changed. The weight of subjective norm, *SN*, on the consumers' intention to purchase increases in the United Kingdom as the respondents' level of education improves. In France, it increases as the size of the respondents' hometown increases. The weight of perceived behavioural control, *PBC*, not significant in the standard situation, becomes gradually less relevant in explaining the consumers' intention to purchase as the Italian respondents' income increases. In the Netherlands, in contrast, this effect is reversed. Still, ageing provokes a decrease of the respective weight as does the presence of children under the age of 16 in France, where the size of the respondents' hometown is positively correlated with the weight of perceived behavioural control, in contrast. The impact of socio-economic and socio-demographic characteristics on the weight of behavioural attitudes, A_B, appears to be distributed unevenly. It becomes less relevant in explaining the consumers' intention to purchase, *I*, with the presence of children under the age of 16 in the pan-European sample, in the Netherlands, and in Germany, where the size of the respondents' home town has the same effect. Whilst a higher level of education increases its weight in Italy, the opposite holds for the Netherlands and France, paradoxically. The weight of perceived risk, *PR*, increases with higher levels of income in Italy and with higher levels of education in France. In the Netherlands higher levels

of education have the opposite effect. Whilst the consumers' trust in information provided by media, T_M, is not subject to any of the effects discussed above, again, the weight of trust in information provided by food chain actors, T_F, become less relevant in explaining the consumers' intention to purchase with an increase in the size of the respondents' hometown in Italy and Germany and the respondents' age in France. Growing older, however, has the opposite effect in Germany. The impact of socio-economic and socio-demographic characteristics on the weight of consumers' trust in information provided by authorities appears to be relatively complex. A high level of income, for instance, positively influences the variables' weight whilst the contrary holds true for the Netherlands. A positive influence can also be observed for the respondents' age in Germany as well as for the level of education and the presence of children under the age of 16 in household in the Netherlands. The impact of trust in information provided by independent sources, T_I, is positively correlated with the respondents' level of education in the United Kingdom, again, whereas the contrary holds for Italy, where moreover the respondents' income increases the weight. The weight of trust in alternative sources, T_A, finally, gradually becomes less relevant with the size of the respondents' hometown in Italy and Germany.

Following the determination of the statistical interaction among the global variables, their relationship with the consumers' intention to purchase chicken in a standard situation (ITP_1) will be assessed in a succeeding step. Assumingly, this relationship might be affected through socio-economic and socio-demographic differences across the sample. Equations (4.9) and (4.10) will be estimated with particular regard to these differences and their effect on the performance of the model. The impact of the respondents' manifold socio-economic and socio-demographic characteristics will be illustrated by including five different parameter shifters in the estimation of the SPARTA model. The parameter shifters (D_i) considered comprise the age of the respondent (D_1), his level of education (D_2), the presence of children under the age of 16 years in the household (D_3), the gross annual income level (D_4), and the size of the town in which the household lives (D_5). Varying the parameters of the ordered probit model as depicted in equation (4.10) according to the parameter shifters allows for assessing to what extent they influence the consumers' intention to conduct a particular behaviour through the model determinants. The corresponding estimates illustrated in table 4.32 are the results of a stepwise selection process which retains only the country-specific parameter shifters significant at the ten percent level. Other values are included for illustrative purposes only. In a first step, coefficients for a *standard purchasing situation* are determined.

Table 4.32 Estimates of the SPARTA Model for a standard situation

Determinants	**EU**	**UK**	**FRA**	**ITA**	**NED**	**GER**
Constant	-0.58	1.13***	-3.13**	-2.19***	1.36	-2.97***
Education			0.82*			0.66***
Town Size	-0.75***				-1.27*	1.39*
Subjective Norm	0.05**	-0.09	-0.08	0.04	-0.02	0.09**
Children				0.08**		
Income		0.04***				
Perceived Behavioural Control	0.13***	0.23***	0.18		-0.10	0.13**
Attitude	0.24***	0.50***	0.18***	0.60***	0.10	0.74***
Education			-0.13*			-0.12*
Income			0.02*			
Town Size	0.14***				0.20*	-0.23*
Risk Perception		-0.08	0.10	0.02		0.07
Education				-0.05***		
Town Size				0.07*		
Trust in Media	-0.01	-0.16**	-0.08	-0.02	0.12	0.08
Trust in Food Chain	0.07**	0.01	-0.38*	0.46**	0.15**	0.09
Age			0.13*	-0.11**		
Education			0.14***			
Income			-0.11*			
Trust in Public Authorities		-0.72***	-0.09		-0.06	0.03
Education		0.17***				
Doctors and Scientists	0.02	-0.62**	0.01	-0.07	0.07	0.04
Education		0.17**				
Trust in Alternative Sources	0.08*	0.86***	0.01	0.17***	0.08	-0.06
Age	-0.06**	-0.29***				
Education		-0.21***				
Chi-Square	190.02*	56.74**	28.70**	88.44**	35.91**	64.82**
Log-likelihood	-2,782.6	-321.10	-415.11	-617.35	-506.75	-591.30
Correct Predictions	0.28	0.44	0.26	0.34	0.37	0.35
Correct Predictions$^{(\S)}$	0.62	0.85	0.45	0.58	0.64	0.67

Note: Asterisks such as *** indicate significance at the one percent level, ** indicate significance at the five percent level, and * indicates significance at the ten percent level. The symbol (§) indicates the correct predictions after a reclassification of the respondents' statements into three categories instead of seven as attributed to the seven point Likert scale. Source: Modified from Mazzocchi et al., 2005b, p. 17.

As illustrated in table 4.32, the comprehension of socio-economic and socio-demographic variables in the model yields more robust values in terms of the within-sample prediction and the likelihood ratio tests. Taking into consideration that the respondents' intention to purchase is mostly represented through a seven point Likert scale, the ordinal probit model presented in equation (4.10) appears to predict the consumers' intention to purchase in a reasonable manner. A comparison of the congruency between the consumers' actual and predicted intention to purchase chicken in a standard situation yields that the SPARTA model succeeds

in correctly predicting 28 percent of the observations for the Pan-European sample. The values of country-specific correct predictions range from 26 percent in France to 44 percent in the United Kingdom. These values improve considerably when rearranging the seven possible answers attributed to the seven point Likert scale to three categories. Category one is confined to values of the intention to purchase below four, i.e. to those respondents that are unlikely to purchase. Category two refers to values of the intention to purchase equal to four, i.e. to those respondents that are indecisive, whereas category three is confined to values above four that can be attributed to respondents that are likely to purchase. This reclassification of the respondents' statements results in an increase of correctly predicted observations to 62 percent for the pan-European sample, 45 percent for France and 85 percent for the United Kingdom (Mazzocchi et al., 2005b, p. 13).

Interestingly, the rearrangement of the respondents' statements into broader categories also yields improved values when estimating the SPARTA model in the environment of a hypothetical salmonella outbreak (table 4.36). With regard to answers based upon the seven point Likert scale, the SPARTA model correctly predicts 40 percent of the pan-European observations. Country-specific values of correct predictions range from 27 percent in the United Kingdom to 49 percent in Italy. Again, as a consequence of rearranging the respondents' statements into three categories, the percentage of pan-European correct predictions increases to 62 percent whilst the percentage for the United Kingdom and Italy increase to 55 percent and 68 percent, respectively. The respective coefficients are depicted in table 4.36 presented in appendix II.

Based on findings attributed to the SPARTA model elucidating the consumers' intention to purchase chicken both in a standard situation and in the environment of a (hypothetical) salmonellae incidence, the succeeding subchapter will present a modified enhancement termed SPARTA II. Whilst the SPARTA model places particular emphasis on socio-economic and socio-demographic differences as explanatory variables, the SPARTA II approach predominantly features population clusters.

4.5 An Enhancement – The SPARTA II Model

As an adjacent enhancement, the SPARTA model is slightly modified taking into consideration the findings from the segmentation analysis conducted in subchapter 4.3.[95] Correspondingly, the element of trust is assumed to no longer affect the consumers' intention to purchase *directly* but through its prior interaction with the global variables, exclusively (Mazzocchi et al., 2005b, p. 22). Graphically, this modification is depicted in figure 4.5.

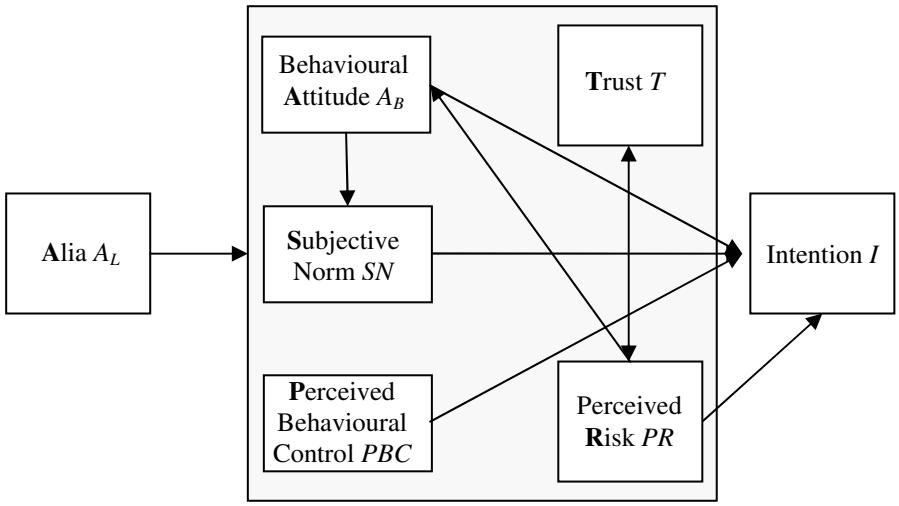


Figure 4.5 The SPARTA II Model
Source: Modified from Mazzocchi et al., 2005b, p. 23.

In contrast to the original SPARTA model as presented in subchapter 4.4, the consumers' intention to purchase chicken is determined through solely *four* global variables. These are behavioural attitude, A_B, subjective norm, SN, perceived behavioural control, PBC, and perceived risk, PR. The element of trust, T, is assumed to affect perceived risk, only. As a consequence of this modification, trust has an *indirect* impact on the consumers' intention to purchase and will therefore not be directly integrated into an estimation of the latter according to the SPARTA II model.

Following this conceptual enhancement, the reciprocal interaction among the global variables needs to be investigated. Moreover, the possible impact of socio-economic and socio-demographic characteristics is included in the analysis. Again, the consumer's perceived behavioural control, PBC, is disregarded since it is determined exogenously and thus exhibits no interaction with other global variables. Findings are depicted in table 4.33.

[95] As for the SPARTA model, implementation for this enhancement partly refer to the cooperation with Mazzocchi et al. (2005b) and their work within the European Commission's TRUST Food Risk communication and Consumer's Trust in the Food Supply Chain Project.

Table 4.33 Statistical interaction among the global variables and demographic factors of influence

	Subjective Norm	**EU**	**UK**	**FRA**	**ITA**	**NED**	**GER**
	Intercept	0.67*	2.03*	3.47***	-0.66	0.52	1.75***
A	Behavioural Attitude	0.41***	0.25	-0.15	0.62***	0.36***	0.24***
T_M	Trust in Media	0.29***	0.28***	0.22***	0.25***	0.35***	0.51***
T_F	Trust in Food Chain Actors	0.15***	0.25***	0.20***		0.28**	0.40***
T_I	Trust in Independent Sources	0.11***		0.26***		0.19**	0.17*
T_A	Trust in Alternative Sources	0.27***	0.49***	0.21***		0.22***	0.38***
T_V	Trust in Vested Interests	0.36***	0.30***	0.25***	0.55***	0.34***	0.34***
	Age	0.11***	0.17*			0.12	
	Level of Education			0.14***			
	Children in the Household					-0.26*	
	Gross Annual Income				-0.13*		0.15**
	Size of Hometown	0.10*	0.06		0.55***		
	Behavioural Attitude						
	Intercept	6.48***	6.35***	6.48***	6.77***	6.75***	6.22***
PR	Perceived Risk	-0.21***	-0.06	-0.18***	-0.07***	-0.23***	-0.24
	Age		0.14**				
	Level of Education		-0.09*				
	Children in the Household	0.16***		0.24**			-0.24**
	Gross Annual Income		0.07*			-0.06	
	Size of Hometown	-0.09**	-0.13*	-0.21	-0.37***	-0.18*	-0.21***
	Perceived Risk						
	Intercept	3.02***	1.72***	2.51***	2.57***	3.74***	3.44***
T_M	Trust in Media		0.22***		-0.22***		
T_F	Trust in Food Chain Actors	-0.29***		-0.33***	-0.25***	-0.15	
T_I	Trust in Independent Sources	-0.10**	-0.13		-0.23***		-0.22**
T_A	Trust in Alternative Sources	0.16***	0.22***	0.27***	-0.40***	0.22**	
T_V	Trust in Vested Interests			0.12*			-0.23**
	Level of Education	-0.09***				-0.20**	
	Children in the Household				0.30		
	Gross Annual Income					-0.14**	
	Size of Hometown	-0.10*	-0.18*				
	Trust						
	Intercept	-0.44***	-0.54***	-1.03***	-0.38**	-0.46***	-0.42***
SN	Subjective Norm	0.17***	0.16***	0.37***	0.11***	0.22***	0.17***
	Age	-0.04***	-0.09***				
	Level of Education			-0.04*	0.10***	-0.04	
	Gross Annual Income						-0.04**
	Size of Hometown	-0.06***			-0.21***		

Note: Asterisks such as *** indicate significance at the one percent level, ** indicate significance at the five percent level, and * indicates significance at the ten percent level. Whilst global variables are measured directly, perceived risk and the different components of trust correspond to their average. Source: Modified from Mazzocchi et al., 2005b, p. 25.

Interestingly, the influence of trust on subjective norm is generally positive. As illustrated in table 4.33, this phenomenon is independent of the addressee of trust and the origin of the sub-

sample, featuring either country-specific observations or the pan-European sample. Moreover, the interrelationship also appears to be effective in the opposite direction. Any increase in the importance of subjective norm has a statistically highly significant and positive impact on trust, ranging from 0.37 in France to 0.11 in Italy. Socio-economic and socio-demographic variables such as the respondents' age or their level of education are only significant in selected sub-samples. In the United Kingdom, for instance, age is positively correlated with subjective norm (0.17); i.e. when growing older respondents ascribe more importance to the opinions of their social environment than otherwise. In France, respondents with a high level of education appear to ascribe more importance to the opinions of their social environment (0.14), whereas in Italy this holds for interviewees from larger cities (0.55). Respondents from the Netherlands ascribe less importance to the opinions of their social environment when children under the age of 16 live in the household (-0.26). Regarding behavioural attitude, the level of perceived risk and, surprisingly, the size of the respondents' hometown generally affect the consumers' attitude towards the purchase and consumption of chicken in an adverse manner. Children under the age of 16 that live in the household have a positive impact on the importance of attitudes in France (0.24), whereas the opposite applies to Germany (-0.24), paradoxically. Likewise, this inconsistency appears to hold for the interrelationship between perceived risk, trust, and other determinants whose impact, being either positive or negative varies from country to country. Even though no clear pattern can be observed except for the impact of subjective norm on trust, it seems worth mentioning that the respondents' level of education is statistically significant and negatively correlated with perceived risk in the Netherlands. In Italy, however, it has a positive effect on trust as do smaller hometowns of the respondents.

Following this analysis of the interrelationship between global variables and socio-economic and socio-demographic variables, the determinants of the SPARTA II model will be estimated. By dint of reverting to results of the cluster analysis conducted in subchapter 4.3.1, the effect of trust on the consumers' intention to purchase will be obtained by estimating a SPARTA II model for each of the three previously circumscribed clusters. Results for the consumers' intention to purchase in a standard situation are depicted in table 4.34.

Table 4.34 Determinants of the SPARTA II Model in a standard situation

Determinants		**Non-Trusters**		**Sceptic Trusters**		**Trusters**	
	United Kingdom	-0.97	***	-0.39		-0.78	*
	France	-1.46	***	-0.97	**	1.47	***
	Italy	-1.22	***	-0.97	**	-1.16	***
	The Netherlands	-1.36	***	-0.71		-0.89	**
	Germany	-1.40	***	-0.86	*	-1.15	***
SN	Subjective Norm	0.02		0.03		0.02	
PBC	Perceived Behavioural Control	0.11	***	0.07		0.07	*
A_B	Behavioural Attitude	0.36	***	0.32	***	0.40	***
PR	Perceived Risk	-0.01		0.06		0.00	
Chi-square		142.45	***	45.30	***	94.71	***
Log-likelihood		-1,721.43		-878.96		-1,202.2	
Correct Predictions		0.32		0.27		0.33	
Correct Predictions[§]		0.60		0.59		0.72	

Note: Asterisks such as *** indicate significance at the one percent level, ** indicate significance at the five percent level, and * indicates significance at the ten percent level. The symbol (§) indicates the correct predictions after a reclassification of the respondents' statements into three categories instead of seven as attributed to the seven point Likert scale. Source: Modified from Mazzocchi et al., 2005b, p. 26.

In a standard situation, the consumers' intention to purchase chicken is mostly determined through behavioural attitude as illustrated in table 4.34. Even though those respondents characterised as trusters are the most likely to be influenced by their behavioural attitude, A_B, (0.40), this similarly applies to the other clusters (0.32 and 0.36, respectively). Whilst neither subjective norm, *SN*, nor perceived risk, *PR*, is statistically significant in a standard situation, perceived behavioural control, *PBC*, appears to have a minor positive impact on trusters' (0.11) and non-trusters' (0.07) intention to purchase chicken, *I*.

A comparison between the level of correct predictions before and after reclassifying the respondents' statements into three instead of seven categories yields that the percentage of correctly predicted observations in a standard situation doubles from an average of 30.67 percent across all clusters to 63.67 percent.

Unsurprisingly, the estimated values of the global variables influencing the consumers' intention and thus the respective findings significantly change when the respondent is confronted with a hypothetical salmonella incidence. This is illustrated in table 4.35.

Table 4.35 Determinants of the SPARTA II Model in the environment of a salmonella outbreak

Determinants		**Non-Trusters**		**Sceptic Trusters**		**Trusters**	
	United Kingdom	-1.08	***	-0.32		-0.37	
	France	-1.14	***	-0.85	**	-0.66	*
	Italy	-1.49	***	-1.03	**	-0.67	**
	The Netherlands	-1.20	***	-0.36		-0.61	*
	Germany	-1.16	***	-0.61		-0.30	
SN	Subjective Norm	0.09	***	-0.01		0.02	
PBC	Perceived Behavioural Control	0.11	***	-0.02		-0.03	
A_B	Behavioural Attitude	0.13	***	0.20	***	0.20	***
PR	Perceived Risk	-0.03		-0.09	**	-0.12	***
Chi-square		67.42	***	54.49	***	51.39	***
Log-likelihood		-1,835.71		-870.73		-1,355.3	
Correct Predictions		0.43		0.44		0.36	
Correct Predictions[§]		0.61		0.66		0.62	

Note: Asterisks such as *** indicate significance at the one percent level, ** indicate significance at the five percent level, and * indicates significance at the ten percent level. The symbol (§) indicates the correct predictions after a reclassification of the respondents' statements into three categories instead of seven as attributed to the seven point Likert scale. Source: Modified from Mazzocchi et al., 2005b, p. 26.

In analogy to the standard situation denoted in table 4.34, behavioural attitude, A_B, is the most important determinant of the consumers' intention to purchase chicken in the environment of a (hypothetical) salmonella outbreak. Again, this holds for all cluster with particular emphasis on those characterised as trusters (0.20) and sceptic trusters (0.20) and, to a lesser extent, for non-trusters (0.13). Moreover, with regard to trusters (-0.12) and sceptic trusters (-0.09), perceived risk, *PR*, has a statistically significant, although negative impact on the consumers' intention to purchase chicken which correspondingly is adversely affected through an increase in perceived risk. Subjective norm (0.09) and perceived behavioural control (0.11), in contrast, are statistically significant determinants of the non-trusters' intention to purchase chicken. Surprisingly, perceived risk is not relevant in explaining their behaviour.

Again, the comparison of correct predictions before and after reclassifying the respondents' statements into three instead of seven categories shows an increase of correctly predicted observations in the environment of a food safety incidence from an average of 41.0 percent across all clusters to 63.0 percent. Thus, such reclassification clearly improves the accuracy of predictions and hence contributes to a comprehensive explanation of consumer behaviour under uncertainty.

4.6 Summary

Following the conceptualisation of a theoretical framework based on Ajzen's (1985) Theory of Planned Behaviour, chapter four presents the results of a pan-European survey which investigates consumer behaviour under uncertainty. The survey, developed within the European Commission's research project Food Risk Communication and Consumers' Trust in the Food Supply Chain, was conducted in spring 2004 and places emphasis on the impact of a (hypothetical) salmonella outbreak on the consumers' intention to purchase chicken.

In a first step, the total of 2,725 valid observations is subject to a descriptive analysis which allows for a detailed investigation of socio-economic and socio-demographic differences across respondents. Considering chicken as a familiar and popular food of frequent purchase throughout Europe, emphasis is moreover placed on the respondents' purchasing patterns and their perception of risks attributed to its consumption. Since respondents assumingly seek to reduce their uncertainty after a confrontation with a hypothetical food safety incidence through additional information, focus is furthermore placed on their evaluation of the trustworthiness of different sources of information.

In a subsequent step, a segmentation analysis comprising a principal components analysis and a cluster analysis are performed on the observations. The principal components analysis identifies five principal components of trust, each addressing a different category of information sources. Among these are trust in information provided by media, food chain actors, vested interests, and both independent and alternative sources. Based on these results, the cluster analysis categorises respondents according to their trustfulness. This measure yields three different clusters comprising so-called trusters, sceptic trusters, and non-trusters.

In a consecutive step, the respondents' intention to purchase chicken is estimated by means of the SPARTA model based on global variables such as behavioural attitude, A_B, subjective norm, *SN*, perceived behavioural control, *PBC*, perceived risk, *PR*, and trust, *T*. Subsequent to quantifying the statistical interaction among these variables, the model identifies determinants of the respondents' intention to purchase chicken according to their socio-economic and socio-demographic differences. Estimates are conducted both for a standard purchasing situation and the scenario of a (hypothetical) salmonella incidence. In a standard purchasing situation, merely behavioural attitudes appear to significantly influence the respondents' intention to purchase chicken – in a positive manner, as expected. Even though to a lesser

extent, this also applies to the scenario of a (hypothetical) salmonella incidence. Moreover, perceived risk and trust in information provided by media significantly influence the respondents' intention to purchase chicken, in a negative manner, however. Interestingly, the impact of respondents' socio-economic and socio-demographic differences is of relevance solely in the environment of a food safety incidence. Taking into consideration the marginal differences in consumer behaviour attributed to these characteristics, the model is subsequently modified.

In a final step, the respondents' intention to purchase chicken is estimated through the SPARTA II model which is based on the previously identified population clusters. This measure is assumed to improve the derivation of an adequate response to a food safety incidence since addressing certain population clusters appears to be a less complex matter than addressing consumers solely according to socio-economic characteristics. Moreover, trust is no longer assumed to have a direct impact on the consumers' intention to purchase but influences the respondents' normative beliefs and their perception of risk. Again, estimates are conducted for a standard purchasing situation and the scenario of a (hypothetical) salmonella incidence. Interestingly, findings are largely congruent with those of the SPARTA model, thus emphasising the role of behavioural attitudes as the crucial determinant for the respondents' intention to purchase. Only in the environment of a (hypothetical) food safety incidence perceived risk and trust in information provided by media are additional, significant factors of influence.

In summary it can be ascertained that the measures outlined above allow for a detailed understanding of the determinants behind the consumers' intention to purchase chicken – both before and after an external shock. Yet, despite the comprehension of findings from a segmentation analysis, *regional* particularities remain mostly disregarded and usually cannot be educed from the totality of the pan-European sample without a loss of information. Consequently, chapter five will be devoted to an empirical analysis of possible differences between pan-European and German observations featuring consumer behaviour under uncertainty.

5 Consumers' Reactions to a Food Safety Incidence in Germany

The previous chapter has substantially depicted pan-European consumer behaviour and its contingent changes induced through an external shock such as a (hypothetical) salmonella outbreak. In consistency with Ajzen's (1985) Theory of Planned Behaviour, trust has been introduced into the analysis in an attempt to comprehend the motives behind the consumers' behaviour under uncertainty. So far, emphasis has been placed on an analysis of mostly aggregated data in order to exclude contortions attributed to regional distinctions. For the purpose of thoroughly elucidating some country-specific particularities, this premise will not be sustained any longer but replaced by an explicit focus on German observations.

5.1 Factor Analysis

Since a descriptive analysis of German observations has already been conducted in chapter four, the analysis of trust as a determinant of consumer behaviour in Germany will directly proceed with a factor analysis. As for the pan-European observations, the factor analysis of German observations is based on the respondents' subjective evaluation of the trustworthiness of several different suppliers of food safety information as investigated in item 43 of the attached questionnaire. Results, both country-specific and aggregated, have already been depicted in table 4.18.

In analogy to the methodology outlined in subchapter 4.3.1, a factor analysis involving a principal components analysis as an extraction method is subsequently performed on the German data set.[96] This step aims at identifying possible principal components inherent in the consumers' judgement and at allowing for a comparison with their pan-European analogues.[97]

Factor analysis is a generic denomination for a class of multivariate statistical techniques which aim at explaining the variability, i.e. the correlations among a number of observable random variables in a data matrix through a significantly smaller set of underlying dimensions. These are termed *factors* and can generally be understood as latent common characteristics of the observable random variables (Hair et al., 1998, p. 90). The observable random variables are modelled as linear combinations of the factors, plus error terms.

96 The factor analysis is restrained to a total number of 451 valid German observations.

97 For two reasons, the European observations have not been adjusted by means of excluding German observations. First, German observations account for only 16.55 percent of all observations and, second, similarly precise data could no be obtained for Europe.

Generally, a factor analysis comprises four stages. In a first step, the correlation matrix for all variable combinations is computed. The intercorrelations allow for ex ante identifying variables which should possibly remain unconsidered in the succeeding steps of the analysis due to low correlations with the remaining variables. In a second step, factors are extracted from the correlation matrix by means of an extraction method such as the *principal factor extraction*, often wrongly referred to as principal components extraction, or the maximum likelihood method, for example. Different statistical measures indicate whether the implied factor model seems suitable for reducing the variables to certain underlying dimensions. Often, an unrotated factor solution does not provide the information that offers the most adequate interpretation of the variables under examination. This difficulty, however, can be overcome by means of *rotating the factors* in a third step. A factor rotation corresponds to a redistribution of the variance from earlier factors to latter ones in an attempt to achieve a simpler, theoretically more meaningful factor pattern.[98] Finally, *factor scores*, representing a composite measure created for each observation on each factor extracted can be computed. Factor weights are used in conjunction with the original variable values to calculate each observation's score. Taking into consideration the consumers' assignment to different population clusters in a subsequent stage of the analysis, factor scores will be computed to represent the respective factors in the forthcoming cluster analysis (Hair et al., 1998, p. 119).

Regarding the German data, an exploratory factor analysis was conducted by using a *principal factor extraction* and a *varimax rotation*. Latter was employed to facilitate the interpretability of factors by maximizing the variance of loadings on each factor (Tabachnick and Fidell, 1989, p. 62). Questionnaire data were included for factor analysis for a particular construct if at least 80 percent of all items within that construct were answered, and median replacement was used for the least one percent of missing items. Variables that fell outside of the skewness range of ± two or the kurtosis range of less than seven were excluded from the factor analysis. Any item within each construct that was not correlated by at least ± 0.30 with at least one other item was eliminated from analysis. The number of analysable cases exceeds the minimum recommended number of five cases per item (Tinsley and Tinsley, 1987, p. 420) with at least 100 cases (Kline, 1994, p. 37). The factorability of items was confirmed by using the Bartlett test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy as illustrated in table 5.1.

[98] Generally, a factor rotation aims at adjusting the factors into a position as orthogonal as possible in order to generate more distinct factors and to thus facilitate the factor interpretation.

Table 5.1 KMO measure and Bartlett test of sphericity

KMO measure		0.893
Bartlett test of sphericity	approximate chi-square	5,603.03
	df	253
	Significance	0.000

According to Kaiser (1974, p. 33), a KMO measure of 0.893 indicates a *meritorious* selection of variables. The Bartlett test of sphericity yields a high chi-square value of 5,603 and a significance level of 0.000. The latter indicates that the hypothesis of all correlations between the 23 variables being zero can be rejected with a probability of error of 0.000.

Another measure to quantify the degree of intercorrelations among the variables and the appropriateness of a factor analysis is the measure of sampling adequacy (MSA) which is denoted in the anti-image correlation matrix. Regarding the German data, the measure of sampling adequacy ranges from 0.734 to 0.956 and can thus be understood to be meritorious on average. The anti-image correlations indicate that no variable should be excluded from the analysis at this stage.

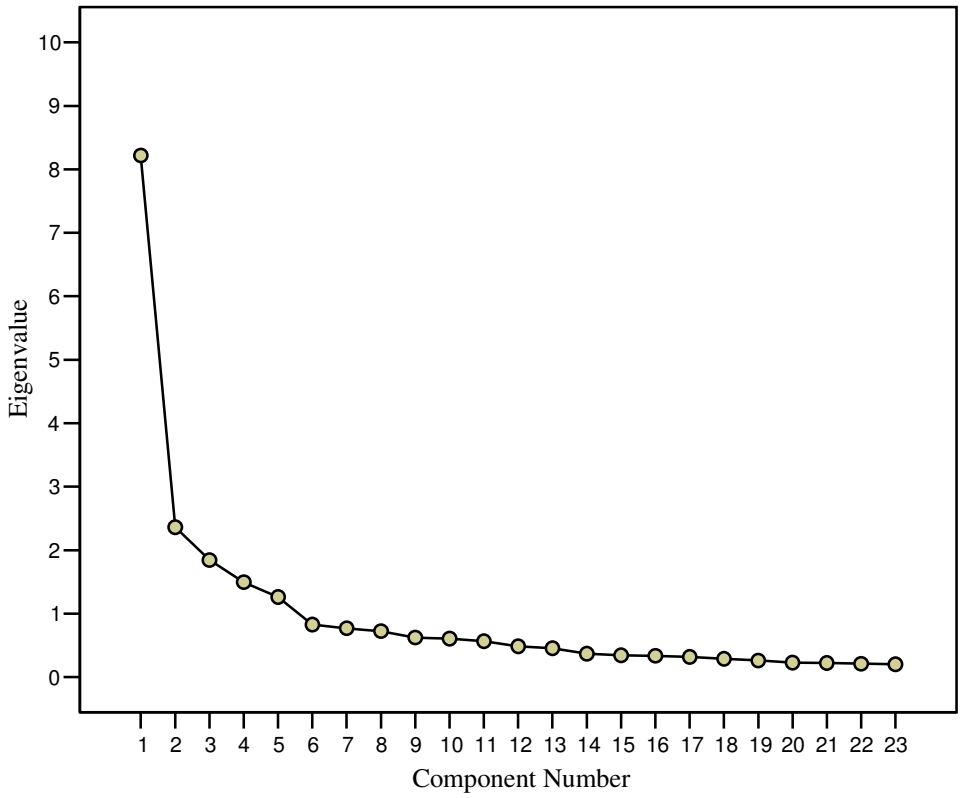


Figure 5.1 Scree Plot

The number of factors extracted is determined by a screeplot as illustrated in figure 5.1 by considering the recommended criteria, i.e. an eigenvalue exceeding the value of one and at least two items loading on a theoretically interpretable factor, to obtain a solution being parsimonious yet reliable (Tabachnick and Fidell, 1989, p. 68).

In compliance with Kaiser (1958), components with eigenvalues less than one are excluded, thus retaining only those components that account for more variance than the average variable. Items with a factor loading exceeding 0.40 and no secondary factor loading exceeding 0.30 were retained (Comrey and Lee, 1992, p. 49). As illustrated in figure 5.1, the number of factors extracted amounts to five which explain a total of 66.000 percent of the total variance explained as denoted in table 5.2.

Table 5.2 Percentage of total variance explained

Component	Extraction sum of squared factor loadings			Rotation sum of squared factor loadings		
	total	% of variance	cumulative %	total	% of variance	cumulative %
1	8.218	35.732	35.732	3.961	17.224	17.224
2	2.361	10.264	45.996	3.511	15.266	32.490
3	1.843	8.014	54.010	3.276	14.244	46.734
4	1.496	6.505	60.514	2.282	9.923	56.656
5	1.262	5.486	66.000	2.149	9.344	66.000

Extraction method: Principal Factor Extraction. Rounding errors may occur.

Following the identification of five different factors by means of a principal factor extraction, a component matrix is determined in an adjacent step. In order to allow for a better interpretability, the component matrix is rotated and normalised. Results are illustrated in table 5.3.

Table 5.3 Principal component loadings for trust in food safety information in the German data set

	Components of Trust				
Information Source	T_M	T_F	T_I	T_A	T_V
Shopkeepers	-0.001	**0.823**	0.156	0.010	0.129
Supermarket	0.119	**0.792**	0.175	-0.059	0.206
Organic Shop	0.175	**0.715**	0.121	0.368	-0.069
Specialty Store	0.220	**0.780**	0.160	0.168	0.078
Farmers /Breeders	0.131	**0.739**	0.133	0.035	0.186
Processors	0.107	**0.609**	0.243	-0.102	0.467
Health Officials	0.207	0.288	**0.755**	0.091	0.045
University Scientists	0.160	0.165	**0.687**	0.229	0.151
National Food Authority	0.041	0.182	**0.818**	0.056	0.081
Government	0.161	0.118	**0.561**	0.086	**0.569**
Political Groups	0.162	0.101	0.262	0.291	**0.733**
Environmental Groups	0.138	0.058	0.219	**0.844**	0.166
Animal welfare Organisations	0.105	0.070	0.053	**0.881**	0.135
Consumer Organisations	0.208	0.113	**0.540**	0.482	-0.056
European Food Safety Authority	0.206	0.136	**0.659**	0.005	0.282
Television documentary	**0.705**	0.082	0.195	0.211	0.113
Television news / current affairs	**0.801**	0.089	0.288	0.035	0.007
Television advertising	0.196	0.312	0.016	0.104	**0.695**
Newspapers	**0.786**	0.193	0.125	0.149	0.047
Internet	**0.520**	0.048	-0.072	0.000	0.203
Radio	**0.824**	0.139	0.229	0.056	0.124
Magazines	**0.577**	0.247	0.125	0.102	0.431
Product Label	0.272	0.426	0.190	-0.028	0.445
Component Label	*Media*	*Food Chain*	*Independent*	*Alternative*	*Lobbies*

Note: A *varimax* rotation with Kaiser Normalisation has been conducted. The rotation converged in six iterations. Values exceeding 0.5 are printed bold.

Generally, the results of a principal components analysis performed on the German data set appear to *approximately* resemble the previously discussed pan-European findings. At first glance, the mean values of the principal component loadings (0.259 and 0.262, respectively) appear to confirm a high degree of congruence between German and pan-European data for the numerical values of the respective principal component loadings. Yet, as their respective standard deviations (0.254 and 0.2555) are similar in size to the mean values as illustrated in table 5.4, no final conclusion concerning the congruence between German and pan-European data can be derived at this stage of the analysis.

Table 5.4 Statistical congruence between German and pan-European principal component loadings

Statistical measure	German observations	Pan-European observations
Mean value	0.2597	0.2627
Standard deviation	0.2543	0.2555

Still, a high degree of congruence between German and pan-European data seems to be reflected in the composition of the different principal components of trust in food safety information as depicted in table 5.3.

Both for German and pan-European observations, the first component, T_M, comprises trust in different information sources briefly summarised as media. In detail, trust in media comprehends consumers' trust in sources as diverse as television documentaries and news, magazines and newspapers, or internet and radio broadcasting. Even though the respective principal component loadings have slightly increased for all sources with the exception of internet and magazines, the composition of the component remains entirely unchanged. The second component, T_F, subsumes trust in information provided by food chain agents. Both for German and pan-European observations, trust in food chain agents is synonymical for trust in nearly all stations of the value chain, i.e. farmers, breeders, shopkeepers, supermarkets, organic shops, and specialty stores. Interestingly, the respective principal component loadings consistently exhibit larger values for German than for pan-European observations, as illustrated through the measured values for organic shops (0.715 and 0.68, respectively), for instance. This shift results in considering processors appendant to food chain actors (0.609) instead of assigning them to vested interests as pan-European observations suggest. The third component, T_I, refers to consumers' trust in information about food safety issues provided by independent sources. Both for German and pan-European observations, independent sources comprise health officials, university scientists, national and European food safety authorities, and consumer organisations. Except for health officials and university scientists, principal component loadings generally are slightly more distinct for German than for pan-European observations, as the measured values for consumer organisations (0.540 and 0.52, respectively), for example, illustrate. The fourth component, T_A, refers to trust in information provided by allegedly alternative sources like environmental groups or animal welfare organisations. Since their particular principal component loadings are relatively high (0.844 and 0.881, respectively), these sources of information cannot be assigned to other components. Moreover, their values are nearly identical for both German and pan-European observations. The fifth component, T_V, finally, comprises trust in information about food safety matters issued by sources which are assumed to be vested interests. According to both German and pan-European data, these lobbies include governments, political groups, and, unsurprisingly, television advertising. Except for the latter (0.695 and 0.600, respectively), principal component loadings are less distinct for German than for pan-European observations.

A certain particularity is to be found in product labels. Their assignment to the component subsuming trust in information provided by food chain agents, T_F, induced through pan-European observations (0.43), marginally changes to an assignment to the component featuring vested interests, T_V, when considering German data (0.445). Still, the respective component loading for the factor resembling trust in food chain actors, T_F, is nearly equal (0.426) which circumvents a clear classification at this stage of the analysis.

As expected, findings of a principal components analysis focussing on German observations mostly resemble the pan-European average. Even though some exceptions emerge, the composition of the principal components of trust in food safety information remains nearly unchanged, thereby indicating that with regard to the evaluation of trustworthiness, in principle German respondents reach the same conclusions as other European consumers.

5.2 Cluster Analysis

With regard to the conclusions of the factor analysis conducted in the previous subchapter, a high level of conformity between pan-European and German findings can also be expected for the outcome of a cluster analysis. Based on the methodology outlined in section 4.3.2, a cluster analysis is subsequently performed exclusively on German observations. Due to a total number of 451 observations, a hierarchical k-means cluster analysis is performed. The analysis is preset to three clusters and a maximum of ten iterations which fail to converge. The maximum absolute coordinate change for any cluster centre is 0.033 with a minimal distance between initial cluster centres of 7.702. Factor values were computed for the five principal components identified in subchapter 5.1. Surprisingly, as illustrated in table 5.5, the assumption of a high level of conformity between pan-European results depicted in table 4.24 and country-specific results cannot be confirmed.

Table 5.5 Categorisation of clusters featuring the German data set according to the k-means method

Clusters	**1**	**2**	**3**
Trust in media	-0.23	0.04	0.20
Trust in food chain actors	-0.94	0.60	-0.04
Trust in independent sources	0.38	-0.34	0.22
Trust in alternative sources	0.61	0.20	-1.22
Trust in vested interests	-0.17	0.39	-0.59
Absolute Counts	133	216	102
Percentage	29.49	47.89	22.62

Source: Dierks et al., 2005, p. 136.

Prima facie, the notion of classifying the observations into the previously discussed clusters of *non-trusters*, *sceptic trusters* and *trusters* cannot be abided considering the nonuniform values depicted in table 5.5. Moreover, even a univocal derivation of population clusters on the basis of the above values appears to be questionable.

In contrast to the pan-European results, the first population cluster is no longer characterised through negative values exclusively, but shows significant trust being expressed towards food safety information provided by both alternative (0.61) and independent sources (0.38). Strong distrust, however, is expressed towards food chain actors (-0.94), and milder distrust towards media (-0.23), and vested interests (-0.17). This implies that the first population cluster mainly comprehends *alternative trusters* with little confidence in *classic institutions* such as industry and media – instead of generally distrusting consumers as implicated by pan-European observations. This population cluster accounts for 29.49 percent of the German observations.

The discrepancy to the pan-European results also becomes apparent when regarding the second cluster; originally thought to comprehend *sceptic trusters*. German data, however, suggests that the respondents assigned to this cluster appear to be directly opposed to the first population cluster since consumers display trust in nearly all sources of information. Since distrust is only expressed towards information provided by independent sources (-0.34) such as the German and European Food Safety Authorities or consumer organisations, for instance, this cluster appears to comprise consumers which can be characterised as *conservative trusters.* They account for 47.89 percent of the German observations.

Moreover, the discrepancy between the German and pan-European clusters is further endorsed through the composition of the third cluster. In contrast to the pan-European results which are consistently positive and thereby suggest unconditional trust in different sources of information, German findings are diverse, again. Trust, for instance, is expressed towards information provided by media (0.20) and independent sources (0.22) whilst strong distrust, in turn, is expressed towards information provided by alternative sources (-1.22), vested interests (-0.59), and, even though to a negligible extent, towards information provided by food chain actors (-0.04). Obviously, the inconsistency of this pattern allows for characterising it as a population cluster predominantly comprising *sceptic trusters*, accounting for 22.62 percent of the German observations. Results are summarised in table 5.6.

Table 5.6 Categorisation of pan-European and German observations into population classes

Pan-European Observations	German observations
Non-Trusters	Alternative Trusters
Trusters	Conservative Trusters
Sceptic Trusters	Sceptic Trusters

In consideration of the above findings it can be concluded that clustering German respondents into non-trusters, sceptic trusters, and trusters seems to be far less unambiguous than it is for pan-European data. Based on their individual evaluation of the trustworthiness of different sources providing information about food safety issues, the pan-European classification appears to be inappropriate for German observations, regarding both the identification of different population clusters and the explanation of their behaviour in the environment of a food safety incidence.

Thus, as the classification of German respondents into population clusters reflecting the different levels of trustfulness yields unsatisfactory results, a *discriminant analysis* will be conducted in an attempt to determine the impact of socio-demographic and socio-economic factors on consumers' trust in a subsequent stage.

5.3 The Impact of Socio-Economic Factors on Consumers' Trust in Information

With regard to the successive discriminant analysis, a total of six socio-demographic and two socio-economic variables was selected from the attached questionnaire. Among the socio-demographic parameters of interest are the respondents' gender and age, their marital state and level of education, and both the number of children and family members living in the respective household. Socio-economic characteristics refer to the respondents' status of employment and their categorised gross annual income. In the following, a discriminant analysis will determine whether the respondents' assignment to one of the three previously identified clusters can be forecasted by means of these independent variables.

5.3.1 The Impact of Socio-Economic Characteristics on Consumers' Trust

In a first step, the classification of German respondents into different population clusters reflecting trust in different sources of information is based on the subjective evaluation of 23 different sources of information illustrated in table 5.3. Subsequently, a discriminant analysis will investigate whether socio-demographic and socio-economic characteristics appear to be suited for predicting the consumers' overall trust in food safety information.

A discriminant analysis, first conceptualised by Fisher (1936), is a technique for an investigation of multivariate data which aims at assessing whether or not a set of variables, usually termed *predictors*, distinguishes or discriminates between several groups of individuals (Everitt, 1993, p. 103). Generally, application and interpretation of a discriminant analysis are largely comparable to a *regression analysis* with the discriminant function being a linear (variate) combination of metric measurements for two or more independent variables used to predict a single dependent variable. Moreover, this corresponds to a reversed *multivariate analysis of variance* (MANOVA). Typically, a discriminant analysis is used as a feature extraction step before classification.

In case of a classification between only two groups, the most commonly applied method is Fisher's (1936) *linear discriminant function* which results in an *allocation rule* to allocate members to the respective group. Formally, the discriminant function can be expressed as a linear combination, z, of the variables $x_1,...,x_n$,

$$z = a_1x_1 + a_2x_2 + ... + a_nx_n + c \tag{5.1}$$

with a_i as the discriminant coefficient, x_i as the predictor, and c as a constant, such that the maximal separation between both groups is determined. This step corresponds to the maximisation of the ratio, V, of the inter-groups variance of z to its intra-group variance (Everitt and Dunn, 2001, p. 253). The coefficients $a' = [a_1,...a_n]$ therefore have to be chosen so that V, expressed through

$$V = \frac{a'Ba}{a'Sa}, \tag{5.2}$$

is maximised, with S as the pooled within-group covariance matrix and B as the covariance matrix of the groups means. The vector a, maximising V, is given by the solution of the equation

$$(B - \lambda S)a = 0\,. \tag{5.3}$$

As Everitt and Dunn (2001, p. 253) illustrate, the single solution in case of two groups can be shown to be

$$a = \frac{\left(\bar{x}_1 - \bar{x}_2\right)}{S}. \qquad (5.4)$$

Apart from the assumption of multivariate normality, Fisher's (1936) linear discriminant function also depends on both groups having equal covariance matrices for it to provide optimal discrimination. If the covariance matrices differ, a *quadratic discriminant function* is indispensable to distinguish between the groups.

In case of more than two groups, Fisher's (1936) linear discriminant function can be generalised to a multiple discriminant analysis (MDA). The rule for multivariate normal distributions is then applied to each pair of groups to derive a series of classification functions for the variables that separate them (Everitt and Dunn, 2001, p. 257). With three categories of the dependent variable, the discriminant analysis can estimate two discriminant functions, each representing a different dimension of discrimination. These functions are *orthogonal*, i.e. their contributions to the discrimination between groups do not coincide. Technically, this procedure corresponds to a *canonical correlation analysis* which determines the successive discriminant functions and canonical eigenvalues associated with the respective function (Hair et al., 1998, p. 252).

Based on a cluster analysis outlined in section 5.2, 451 German respondents are assigned to different groups by means of their general trust in different sources of information. Overall, 96 respondents (21.38%) are assigned to population cluster one, 165 respondents (36.75%) to population cluster two, and 188 respondents (41.87%) to population cluster three. Tests of equality of group means conducted through a univariate analysis of variance (ANOVA) as illustrated in table 5.7 indicate that no statistically significant difference among the grouping variable means for each independent variable can be observed.[99]

[99] Generally, tests of significance are neither conceived nor suited for ordinal scaled variables such as the respondents' gross annual income or level of education, for example. Respective values therefore should only be understood as indicating an approximate tendency.

Table 5.7 Tests of Equality of Group Means

	Wilk's Lambda	F	df1	df2	Significance
Gender	0.996	0.945	2	446	0.389
Age	0.994	1.376	2	446	0.254
Marital Status	1.000	0.102	2	446	0.903
Level of Education	0.994	1.458	2	446	0.234
Status of Employment	0.998	0.445	2	446	0.614
Persons in the Household	0.998	0.521	2	446	0.595
Gross Annual Income	0.991	2.018	2	446	0.134
Number of Children	0.997	0.619	2	446	0.539

According to Wilk's Lambda depicted in table 5.7, the difference between the grouping variable means for each independent variable problematically is mainly negligible. In case of the respondents' marital status, for instance, no statistically significant difference among the grouping variable means can be ascertained. Moreover, the equality of group means is also confirmed through a summary of the canonical discriminant functions as illustrated in table 5.8.

Table 5.8 Eigenvalues

Discriminant Function	eigenvalue	% of variance	cumulative %	canonical correlation
1	0.028	73.0	73.0	0.165
2	0.010	27.0	100.0	0.101

Eigenvalues of only 0.028 and 0.010, respectively, and a canonical correlation of only 0.165 and 0.101 indicate that the inter-group variance is very low compared to the intra-group variance. These minor differences between the different groups are further endorsed through Wilk's Lambda which is a measure for the level of significance of the discriminatory power of the discriminant functions as illustrated in table 5.9.[100]

Table 5.9 Wilk's Lambda

Test of Function(s)	Wilk's Lambda	Chi-square	df	significance
1 through 2	0.963	16.789	16	0.399
2	0.990	4.569	7	0.712

Since differences between the groups appear to be minor as indicated through a Wilk's Lambda of 0.963 and 0.990, respectively, any discrimination between groups attributed to the unstandardised canonical discriminant functions as illustrated in table 5.9, is rather delicate,

[100] In a sense, Wilk's Lambda is redundant to the canonical correlation coefficient as the sum of Wilk's Lambda and the squared canonical correlation coefficient is always equal to one (Hair et al., 1998, p. 263).

particularly as significance levels of 0.399 and 0.712 indicate a high probability of error concerning the correct classification of German respondents.[101]

Table 5.10 Unstandardised Canonical Discriminant Function Coefficients

	Discriminant Function	
	1	2
Gender	0.878 (0.403)	-0.319 (0.085)
Age	-0.036 (-0.530)	0.084 (0.023)
Marital Status	0.832 (0.499)	0.374 (0.006)
Level of Education	0.202 (0.267)	0.022 (0.528)
Status of Employment	0.136 (0.260)	-0.141 (0.594)
Persons in the Household	-0.480 (-0.561)	0.005 (0.837)
Gross Annual Income	0.424 (0.591)	-0.453 (-0.269)
Number of Children	0.133 (0.129)	0.387 (-1.325)
Constant	-0.507	-2.484

Note: Standardised Canonical Discriminant Function Coefficients are put in parentheses.

The unstandardised canonical discriminant function coefficients as denoted in table 5.10 represent the two estimated discriminant functions. The respondents' gender, for example, enters the first discriminant function with a coefficient value of 0.878 whereas it enters the second function with a coefficient value of -0.319. With regard to the discriminant functions, neither the respondents' age (-0.036 and 0.084, respectively), nor their status of employment (0.136 and -0.141) or, surprisingly, the number of children in the household (0.133 and 0.387) prove to noticeably enter into the discriminant function, thereby suggesting an elimination from the model. Still, table 5.10 also reflects the standardised canonical discriminant function coefficients which allow for a determination of the explanatory power of the individual variables. These standardised canonical discriminant function coefficients, in contrast, indicate that – depending on the very discriminant function – all independent variables need to be considered furthermore. Even though the number of children remains mostly irrelevant (0.129) with regard to the first discriminant function, for example, it indicates a strongly negative impact (-1.325) regarding the second discriminant function. Whilst particularly the respondents' age (-0.530) and their gross annual income (0.591) as well as their marital status (0.499) and the number of persons in the household (-0.561) prove to be significant for the first discriminant function, their level of education (0.528), their status of employment

[101] Standardised canonical discriminant function coefficients are considered in order to eliminate the impact of dissimilar dimensions of the different variables. As mean values are standardised to zero and standard deviations to one, the explanatory power of the individual standardised canonical discriminant function coefficients can be derived in a more convenient manner (Hair et al., 1998, p. 269).

(0.594), and the number of persons (0.837) in the household prove to be significant with regard to the second discriminant function.

Still, the standardised canonical discriminant function coefficients do not allow for an interpretation of the strength of the correlation between the dependent and the independent variable due to contingent interdependencies among the variables. These correlation coefficients are displayed in table 5.11.

Table 5.11 Structure Matrix

	Discriminant Function	
	1	2
Gross Annual Income	0.534*	-0.319
Age	-0.467*	0.084
Education	0.426*	0.374
Gender	0.389*	0.022
Persons in the Household	-0.276*	-0.144
Marital State	0.128*	0.005
Number of Children	-0.151	-0.453*
Status of Employment	-0.125	0.387*

The structure matrix indicates the pooled within-groups correlation between the discriminating variables and the standardised canonical discriminant functions. The variables are ranked by absolute size of the correlation within the canonical discriminant function. An asterisk indicates the largest absolute correlation between each variable and any discriminant function. With a value of 0.534, the highest correlation coefficient is displayed for the respondents' gross annual income. Marital state (0.128) and status of employment (-0.125), in contrast, only display weak (negative) correlations, thereby indicating minor explanatory power.

Graphically, the distribution of the actual classifications across the area created through the canonical discriminant functions is illustrated through a range diagram depicted in figure 5.2.

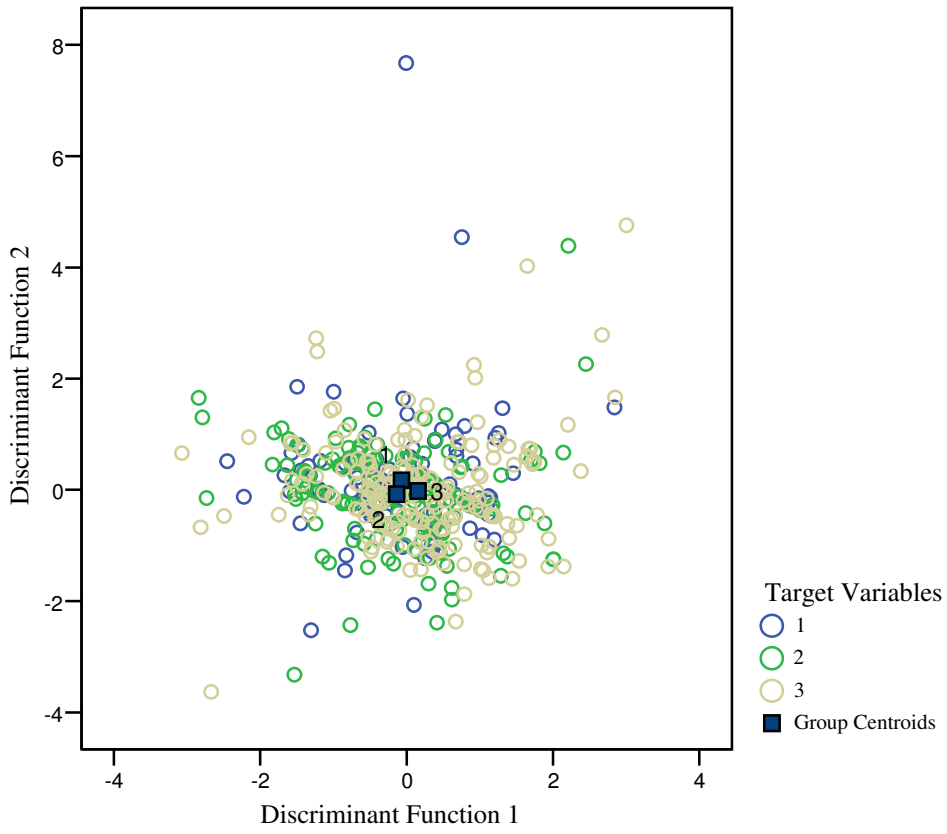


Figure 5.2 Canonical Discriminant Functions

As denoted in figure 5.2, the three group centroids exhibit a high level of proximity. This, in turn, exacerbates an unequivocal discrimination between the different population classes and finally leads to unsatisfactory classification results as illustrated in table 5.12.

Table 5.12 Classification Results

Target Variable		Predicted Group Membership			
		1	2	3	Total
Count	1	1	38	57	96
	2	1	71	93	165
	3	0	58	130	188
%	1	1.04	39.58	59.38	100.00
	2	0.61	43.03	56.36	100.00
	3	0.00	30.85	69.15	100.00

The classification results outlined in table 5.12 yield that on average, merely 44.99 percent of the original grouped cases were classified correctly. With regard to the first population cluster, for instance, only one of the 96 respondents (1.04%) was correctly identified. The remaining 95 respondents (98.96%) were wrongly assigned to other groups. Even though the percentage of wrongly classified respondents (56.97% and 30.85%, respectively) significantly

declines with regard to the second and the third population cluster, it can in summary be ascertained that German respondents cannot be reliably classified into population classes exhibiting different levels of trust on the basis of their individual socio-demographic and socio-economic characteristics. Thus, as a joint investigation of the impact of selected characteristics on consumers' respective trust in a multiplicity of different information sources suggests that the different levels of trustfulness of German respondents cannot be accurately forecasted, a series of further discriminant analyses will determine whether the respondents' correct classification increases in case of individual analyses of the five principal components in subsequent stages.

5.3.2 The Prediction of Consumer's Trust in Selected Sources of Information

In consideration of the high percentage of wrongly classified respondents determined in section 5.3.1, the following subchapter will investigate whether socio-demographic and socio-economic characteristics appear to be better suited for reliably forecasting respondents' trust in each *individual* principal component identified in section 5.1 instead of their *overall* trust in food safety information. As illustrated in table 5.3, these grouped sources of information comprehend food chain agents, media, independent sources, vested interests, and alternative sources.

In the course of the investigation, the respondents' classification into different population clusters is conducted by means of hierarchical k-means cluster analyses as outlined in section 4.3.2 which are based on the respondents' trust in each of the respective principal components. Yet, the analyses are each restrained to the one hundred most and the one hundred least trusting respondents in order to account for a higher heterogeneousness among the consumers' respective perceptions.[102] For all principal components, the analyses are preset to three clusters and a maximum of ten iterations. Generally, convergence is achieved in the fifth or sixth iteration due to small changes in the cluster centres.[103] The maximum absolute coordinate change for any cluster centre always is 0.000 with the minimal distance between initial cluster centres ranging between 2.810 and 3.900. A detailed classification of the respondents conditioned by their trust in the respective principal component is illustrated in table 5.13.

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102 The one hundred most and the one hundred least trusting respondents are identified on the basis of their individual, overall trust in different suppliers of food safety information as specified in table 5.3.

103 In the case of vested interests convergence is not achieved before the ninth iteration.

Table 5.13 Classification of German respondents according to their trust

Clusters	**1**	**2**	**3**
Trust in food chain actors	-2.34	1.28	-1.09
Absolute Counts	23	100	77
Percentage	11.50	50.00	38.50
Trust in media	-2.44	1.21	-1.12
Absolute Counts	22	100	78
Percentage	11.00	50.00	39.00
Trust in independent sources	-2.44	1.16	-1.13
Absolute Counts	24	100	76
Percentage	12.00	50.00	38.00
Trust in vested interests	-3.70	2.25	-0.77
Absolute Counts	31	100	69
Percentage	15.50	50.00	34.50
Trust in alternative	-3.86	2.32	-0.76
Absolute Counts	22	100	78
Percentage	11.00	50.00	39.00

Apparently, the one hundred most trusting respondents are basically assigned to the second cluster which generally features trust in the respective principal component. The remaining respondents are classified as being either strictly or mildly distrusting (on average 12.2% and 37.8%, respectively). Based on this categorisation of the respondents, univariate ANOVA, i.e. tests of equality of group means, are conducted for each of the eight socio-demographic and socio-economic variables. As denoted in table 5.14, these tests yield that there is no statistically significant difference among the grouping variable means for most independent variables. Still, in the case of food chain actors, the respondents' marital state (0.032) appears to be statistically significant. Assumingly, German respondents can be grouped into different population clusters reflecting their trust in food chain actors with regard to this very variable. In the case of media, this also applies to the respondents' marital state (0.004) which is statistically significant. Moreover, regarding respondents' trust in independent sources, a statistical significance, even though only weak, can also be observed for both the number of persons (0.057) and children (0.070) in the household and the respondents' gross annual income (0.076). Apparently, the universal set can be discriminated into different population clusters reflecting their trust in independent sources with regard to these variables. Regarding the respondents' trust in vested interests or alternative sources of information, no statistically significant differences among the grouping variable means can be

Table 5.14 Tests of Equality of Group Means

	Wilk's Lambda	F	df1	df2	Significance
Food Chain Actors					
Gender	0.990	1.025	2	196	0.361
Age	0.989	1.122	2	196	0.328
Marital Status	0.966	3.499	2	196	0.032
Level of Education	0.997	0.332	2	196	0.718
Status of Employment	0.986	1.426	2	196	0.243
Persons in the Household	0.984	1.596	2	196	0.205
Gross Annual Income	0.982	1.833	2	196	0.163
Number of Children	0.993	0.671	2	196	0.512
Media					
Gender	0.998	0.195	2	196	0.823
Age	0.984	1.610	2	196	0.203
Marital Status	0.988	1.191	2	196	0.306
Level of Education	0.954	5.685	2	196	0.004
Status of Employment	0.990	1.005	2	196	0.368
Persons in the Household	0.982	1.801	2	196	0.168
Gross Annual Income	0.994	0.640	2	196	0.529
Number of Children	0.999	0.102	2	196	0.903
Independent Sources					
Gender	0.997	0.274	2	197	0.761
Age	0.995	0.493	2	197	0.611
Marital Status	0.990	0.991	2	197	0.373
Level of Education	0.995	0.454	2	197	0.636
Status of Employment	0.995	0.515	2	197	0.599
Persons in the Household	0.971	2.914	2	197	0.057
Gross Annual Income	0.974	2.606	2	197	0.076
Number of Children	0.973	2.701	2	197	0.070
Vested Interests					
Gender	0.992	0.804	2	196	0.449
Age	1.000	0.001	2	196	0.999
Marital Status	1.000	0.001	2	196	0.999
Level of Education	0.991	0.929	2	196	0.397
Status of Employment	0.996	0.438	2	196	0.646
Persons in the Household	0.992	0.801	2	196	0.450
Gross Annual Income	0.996	0.423	2	196	0.656
Number of Children	0.994	0.570	2	196	0.566
Alternative Sources					
Gender	0.993	0.738	2	196	0.479
Age	0.997	0.267	2	196	0.766
Marital Status	0.988	1.125	2	196	0.296
Level of Education	0.980	1.998	2	196	0.138
Status of Employment	0.990	1.005	2	196	0.368
Persons in the Household	0.997	0.292	2	196	0.747
Gross Annual Income	0.988	1.186	2	196	0.308
Number of Children	0.995	0.470	2	196	0.626

observed. This generally high equality of group means is additionally endorsed through a summary of the canonical discriminant functions reflected through eigenvalues and Wilk's Lambdas as depicted in tables 5.15 and 5.16, respectively.

As illustrated in table 5.15, the discriminant functions' respective eigenvalues range between 0.011 and 0.113 and thus indicate that the ratio of *inter-group* to *intra-group* variance is very low. Evidently, this alludes to a low discriminatory power of the discriminant functions which is additionally endorsed through small canonical correlation coefficients which range between 0.104 and 0.319. The canonical correlation is the square root of the ratio of the inter-group sum of squares to the total sum of squares. Squared, it is the proportion of the total variability explained by inter-group differences. Thus, if the variability in the variables was a consequence of the group differences, the canonical correlation would equal one, whereas it would equal zero if none of the variability was due to group differences.

Table 5.15 Eigenvalues

Discriminant Function	eigenvalue	% of variance	cumulative %	canonical correlation
Food Chain Actors				
1	0.060	60.9	60.9	0.238
2	0.038	39.1	100.0	0.192
Media				
1	0.113	84.4	84.4	0.319
2	0.021	15.6	100.0	0.143
Independent Sources				
1	0.062	64.8	64.8	0.242
2	0.034	35.2	100.0	0.181
Vested Interests				
1	0.024	68.8	68.8	0.153
2	0.011	31.2	100.0	0.104
Alternative Sources				
1	0.060	77.6	77.6	0.238
2	0.017	22.4	100.0	0.130

Moreover, the low discriminatory power of the discriminant functions is also confirmed through Wilk's Lambdas depicted in table 5.16. Values between 0.880 and 0.989 indicate that group means are nearly identical.[104] Furthermore, Wilk's Lambda can be converted into a chi-square statistic which allows for performing a *chi-squared test of goodness of fit*. The null hypothesis which is to be tested assumes that no discriminating power remains in the variables. Still, as *p* exceeds 0.05 for all discriminant functions, the null hypothesis needs to

[104] Besides, merely one canonical discriminant function proves to be (weakly) statistically significant (0.077), whereas the others' values range from to 0.299 to 0.979 and thus are not statistically significant.

be rejected at the five percent level – thereby implying that the independent variables do not have the ability to reliably discriminate between the population clusters.

Table 5.16 Wilk's Lambda

Test of Function(s)	Wilk's Lambda	Chi-square	df	significance
Food Chain Actors				
1 through 2	0.909	18.439	16	0.299
2	0.963	7.261	7	0.402
Media				
1 through 2	0.880	24.628	16	0.077
2	0.980	3.978	7	0.782
Independent Sources				
1 through 2	0.910	18.158	16	0.315
2	0.967	6.456	7	0.488
Vested Interests				
1 through 2	0.966	6.669	16	0.979
2	0.989	2.088	7	0.955
Alternative Sources				
1 through 2	0.928	14.481	16	0.563
2	0.983	3.301	7	0.856

In addition to the above, discriminant functions are interpreted by means of standardised coefficients and a structure matrix. *Standardised* beta coefficients are given for each variable in each canonical discriminant function, and the larger the standardised coefficient, the greater the contribution of the respective variable to the discrimination between groups. Still, with regard to the very principal components, the contribution of the respective independent variables strongly varies. This is denoted in table 5.20 presented in appendix II.

The subsequent structure matrices illustrated in table 5.21 also presented in appendix II indicate which independent variables define a particular discriminant function since the factor structure coefficients correspond to the correlations between the variables and the discriminant functions. Thus, discriminant function coefficients denote the unique contribution of each independent variable to the discriminant function whilst structure coefficients denote the simple correlations between the variables and the discriminant functions. As illustrated in table 5.21, variables are ranked by absolute size of the correlation within the canonical discriminant function. An asterisk indicates the largest absolute correlation between each variable and a discriminant function. Generally, it can be remarked that the first canonical discriminant function is usually determined through the respondents' level of education, and to a lesser extent through their status of employment and the number of persons in the household. The second canonical discriminant function, in contrast, is mostly determined through the respondents' marital state, their age and gender, and through

their gross annual income. Even though to a lesser extent, the function is also determined through the number of children in the household.

With regard to the classification results denoted in table 5.17, it generally needs to be remarked that German respondents cannot be reliably classified into population classes exhibiting different levels of trust in principal components on the basis of their individual socio-demographic and socio-economic characteristics since on average only 51.31 percent of the respondents are classified correctly.

Table 5.17 Classification Results

Principal Component	Percentage of correctly classified consumers
Food Chain Actors	52.30
Media	51.26
Independent Sources	53.00
Vested Interests	48.70
Alternative Sources	51.30

This highly unsatisfactory overall success rate indicates that a classification of German respondents into population classes exhibiting different levels of trust in principal components on the basis of their socio-demographic and socio-economic characteristics has failed – even if the percentage of correctly classified consumers clearly exceeds the expectancy value of a random guess (33.33%). Still, an overall success rate of merely 51.31 percent does not appear to be well suited to allow for a precise prediction of the respondents' trust in any of the five principal components.

Moreover, as indicated in table 5.22 presented in appendix II, the respondents' predicted group membership mostly appears to be deficient. Only respondents assigned to the second cluster, generally comprehending consumers who exhibit trust in the respective source, are accurately classified. The percentage of correctly predicted cluster memberships ranges from 79.00 in the case of food chain actors to 94.00 percent when considering vested interests. Both the respondents' membership in the first cluster, comprising strong distrust, and the third cluster, comprising mild distrust, in contrast, cannot be accurately predicted. As table 5.20 illustrates, respondents originally assigned to the first cluster appear to be the least accurately classified with a portion of correctly predicted cases ranging from 0.00 to 13.64 percent. This unsatisfactory classification also applies to those respondents originally assigned to the third cluster. With a portion of correctly predicted cases between 4.41 and 32.89 percent, they also appear to be classified in a rather unreliable manner. Surprisingly, incorrectly classified

respondents from the first cluster, i.e. those respondents generally exhibiting strong distrust are more likely to be classified as appertaining to the second cluster, featuring trust in the very principal components than to the third cluster, parallelly featuring mild distrust, as could have been expected in principle.

Resumptive, and perhaps surprisingly, it can be ascertained that German respondents cannot be reliably classified into population classes exhibiting different levels of trust in the previously identified principal components on the basis of their individual socio-demographic and socio-economic characteristics.

5.4 The SPARTA II Model applied to German Data

Following the classification of German respondents into different population clusters as featured in section 5.2, the subsequent paragraphs will focus on estimating the respective determinants of consumer behaviour as ascertained through the revision of Ajzen's (1985) Theory of Planned Behaviour outlined in subchapter 4.5. As for the pan-European investigation, components will be determined for two scenarios. The estimation for both a standard purchasing situation and the environment of a hypothetical salmonella outbreak allows for a precise identification of changes in consumer behaviour directly attributed to a (hypothetical) food safety incidence. Moreover, the explicit consideration of only German observations allows for a subsequent comparison between the reactions of German and European respondents.

5.4.1 Consumer Behaviour in a Standard Situation

As in section 4.5, the conceptual framework for determining the consumers' intention to conduct a particular behaviour, *I*, is provided through the SPARTA II model which corresponds to an enhancement of the SPARTA model originally presented in subchapter 4.4. Compared to the SPARTA model, the SPARTA II model considers trust, *T*, only as *indirectly* influencing the consumers' intention to purchase. Merely subjective norm, *SN*, perceived behavioural control, *PBC*, behavioural attitude A_B, and perceived risk, *PR*, are assumed to have a direct impact on consumer behaviour. Their respective estimates for a standard purchasing situation are depicted in table 5.18.

Table 5.18 Determinants of the SPARTA II Model for a standard situation (German data)

		Cluster		
Variable		Alternative Trusters	Conservative Trusters	Sceptic Trusters
	Constant	-1.2942 (0.7499)	-0.6704 (0.6998)	-1.0010 (0.8474)
SN	Subjective Norm	0.0691 (0.06956)	0.1587 (0.0577)	0.0943 (0.0866)
PBC	Perceived Behavioural Control	0.1588 (0.0951)	0.1388 (0.0802)	0.2281 (0.1127)
A_B	Behavioural Attitude	0.3989 (0.1061)	0.3814 (0.0942)	0.2723 (0.1306)
PR	Perceived Risk	0.1057 (0.0786)	-0.0424 (0.0585)	-0.0043 (0.1049)

Standard errors are put in parenthesis. Perceived risk, *PR*, is expressed as a weighed average of the respondents' perception of risk factors. The weighs correspond to the level of knowledge of the respective risk factors.

The above estimates are based upon 377 valid observations of which 120 (31.8%) correspond to the first cluster characterised as mainly comprehending alternative trusters.[105] The count of conservative trusters amounts to 175 (46.4%) observations whereas sceptic trusters only account for 82 (21.8%) observations.

As illustrated in table 5.18, the German consumers' intention to purchase chicken, *I*, in a standard situation is predominantly determined through behavioural attitude, A_B. As depicted in table 4.35, this likewise holds for all population clusters inherent in German and pan-European observations. Still, differences regarding the impact of behavioural attitude, A_B, across the clusters indicate that respondents characterised as alternative trusters (0.40) and conservative trusters (0.38) are influenced in a clearly stronger manner than respondents characterised as sceptic trusters (0.27). Interestingly, the opposite applies to perceived behavioural control, *PBC*, which has a stronger impact on sceptic trusters (0.23) than it has on alternative trusters (0.16) or conservative trusters (0.14). Even though to a lesser extent, normative beliefs, i.e. subjective norm, *SN*, also has a positive impact on all population clusters ranging from 0.16 for conservative trusters to 0.09 for sceptic trusters and 0.07 for conservative trusters. Perceived risk, *PR*, finally, surprisingly has a positive impact (0.11) on the intention to purchase chicken of respondents characterised as alternative trusters. Its impact on conservative trusters (-0.04) and sceptic trusters (-0.00), however, is slightly negative – even though mainly negligible. Except for the two estimates portrayed last and the impact of behavioural attitude, A_B, on the intention to purchase chicken of respondents characterised as sceptic trusters (0.27), all estimates based on German observations slightly exceed the respective estimates for a standard situation based on pan-European estimates.[106]

[105] Again, due to incompletely answered questionnaires, not all 451 valid German observations were applicable as a sound basis for the above estimates.

[106] Pan-European estimates for the SPARTA II model are denoted in table 4.35.

In summary it can be ascertained that behavioural attitude, A_B, is the most significant determinant of the German respondents' intention to purchase chicken in a standard situation. The impact of perceived risk, *PR*, on their behaviour, in contrast, surprisingly remains mostly negligible.

5.4.2 Consumer Behaviour in the Environment of a Food Safety Incidence

As expected, estimates for determinants of the German respondents' intention to purchase chicken, *I*, abruptly change once respondents are confronted with a hypothetical salmonella outbreak. This aspect is particularly emphasised through the increasingly negative impact of perceived risk, *PR*, as illustrated in table 5.19.

Table 5.19 Determinants of the SPARTA II Model after a salmonella outbreak (German data)

		Cluster		
Variable		Alternative Trusters	Conservative Trusters	Sceptic Trusters
	Constant	-0.3650 (0.7405)	-2.7934 (0.7024)	-1.411 (0.8750)
SN	Subjective Norm	-0.0162 (0.0689)	0.0708 (0.0556)	0.0118 (0.0875)
PBC	Perceived Behavioural Control	0.0009 (0.0883)	0.2377 (0.0790)	0.1395 (0.1086)
A_B	Behavioural Attitude	0.2698 (0.0910)	0.3941 (0.0914)	0.2617 (0.1116)
PR	Perceived Risk	-0.2558 (0.0775)	0.0029 (0.0568)	-0.1503 (0.1009)

Standard errors are put in parenthesis. Perceived risk, *PR*, is expressed as a weighed average of the respondents' perception of risk factors. The weighs correspond to the level of knowledge of the respective risk factors.

In contrast to table 5.18, the above estimates are based upon 424 valid German observations. Of these, 140 (33.0%) observations correspond to the so-called alternative trusters, whilst conservative trusters account for 186 (43.9%) observations. Sceptic trusters, finally, account for 98 (23.1%) observations.

As in the standard purchasing situation, behavioural attitude, A_B, remains the decisive factor determining the German consumers' intention to purchase chicken, *I*, in the environment of a hypothetical salmonella outbreak. Again, this also holds for all population clusters inherent in German and pan-European observations.[107] Yet, whilst the impact of behavioural attitude on respondents characterised as conservative trusters (0.39) and sceptic trusters (0.26) remains nearly unchanged, its influence on alternative trusters (0.27) deteriorates. Interestingly, this applies to the impact of subjective norm, *SN*, on respondents characterised as alternative trusters (-0.02), conservative trusters (0.07) and sceptic trusters (0.01) alike. With the exception of its influence on conservative trusters (0.24) which nearly doubles, this

[107] The estimates based on aggregated, pan-European observations for the scenario of a (hypothetical) food safety incidence are presented in table 4.36.

furthermore applies to the impact of perceived behavioural control, *PBC*, on respondents regarded as sceptic trusters (0.13) and alternative trusters (0.00). Except for its negligible influence on conservative trusters (0.00), the impact of perceived risk, *PR*, finally, increases. Following a food safety incidence, it significantly affects the consumers' intention to purchase chicken in a negative manner, most notably regarding sceptic trusters (-0.15) and alternative trusters (-0.26).

Generally, the alternative trusters' intention to purchase chicken, *I*, appears to be particularly influenced through changes in the impact of perceived risk, *PR*, attributed to the transition from a standard purchasing situation (0.11) to the environment of a hypothetical food safety incidence (-0.26). Whilst other population clusters seem to react in a less distinctive manner, the analysis of pan-European observations arrives at another conclusion. Paradoxically, estimates based on aggregated data suggest that non-trusters are the less prone to adjust their intention to purchase in consequence of the transition from a standard purchasing situation (-0.01) to a hypothetical salmonella outbreak (-0.03).[108] Estimates for trusters (0.00 and -0.12) and sceptic trusters (0.06 and -0.09), in contrast, reflect a slightly stronger reaction.

These findings illustrate that – irrespective of behavioural attitude, A_B, remaining the decisive factor of influence – the impact of all determinants but perceived risk, *PR*, deteriorates in the environment of a hypothetical salmonella outbreak. The negative influence of perceived risk, *PR*, on the consumers' intention to purchase chicken, however, increases.

Generally, the dimension of changes in the German consumers' intention to purchase chicken, *I*, appears to be significantly higher compared to those of estimates based upon pan-European data. Despite contingent discrepancies regarding the classification of observations into population clusters, German consumers feature a partially higher sensibility regarding the adjustment of their behaviour in consequence of a (hypothetical) food safety incidence than other European consumers. Taking into consideration that as a matter of fact no population cluster based exclusively on German observations has been characterised as distrusting per se, this result comes somewhat unexpected. Apparently, German consumers generally are more trustful in view of food safety information than their pan-European counterparts but react in a significantly more sensitive manner at the occurrence of a food safety incidence. This trait is not only reflected in mostly higher estimates but particularly in strong parameter values of decisive determinants such as behavioural attitude, A_B, and perceived risk, *PR*, hence

[108] The respective estimates based on aggregated, pan-European observations for the scenarios of a standard purchasing situation and a (hypothetical) food safety incidence are presented in both tables 4.35 and 4.36.

emphasising their eminent impact on the consumers' intention to conduct a particular behaviour. Moreover, since perceived risk, *PR*, was introduced into the analysis as a conceptual enhancement of Ajzen's (1985) Theory of Planned Behaviour, an improvement concerning the understanding of consumer behaviour subject to random external shocks appears obvious.

5.5 Summary

Whilst chapter four has thoroughly analysed the pan-European perspective of trust as a determinant of consumer behaviour under uncertainty, chapter five is restrained to German consumers, exclusively. As the methodology employed remained unchanged, this approach allows for positively identifying particularities attributed to regional distinctions.

Along the lines of the preceding pan-European investigation, a factor analysis comprising a principal component extraction is conducted in a first step. Unsurprisingly, findings of a principal components analysis focussing on German observations mostly resemble the pan-European average. Even though some exceptions emerge, the composition of the principal components of trust in food safety information remains nearly unchanged, thereby indicating that with regard to the evaluation of trustworthiness, German respondents in principle reach the same conclusions as their European counterparts.

In a subsequent step, a cluster analysis is performed on the German observations, categorising respondents according to their trust in the previously identified principal components. As for pan-European findings, this measure yields three different population clusters. Still, the original notation cannot be abided since German respondents are classified in population classes which are composed in a slightly different manner. Respondents pertaining to the first population cluster predominantly exhibit trust in both independent and alternative sources and thus generally are referred to as *alternative trusters*. Respondents pertaining to the second population cluster, in contrast, appear to be directly opposed to the first one since they mainly exhibit trust in food chain actors and vested interests and are thus termed *conservative trusters*. The third population cluster, finally, displays a very inconsistent pattern hence characterising the respective respondents as *sceptic trusters*.

Based on these findings, a discriminant analysis conducted in a subsequent step aims at analysing whether selected socio-demographic and socio-economic characteristics appear to

be well suited for distinguishing between different population classes. Disappointingly, the discriminant analysis yields that merely 44.79 percent of the respondents could be classified correctly on the basis of their socio-demographic and socio-economic characteristics. In consideration of the high percentage of wrongly classified respondents, further discriminant analyses are conducted in an attempt to determine whether the socio-demographic and socio-economic characteristics are better suited for reliably predicting the respondents' trust in each of the previously identified principal components individually. Yet, even if the overall success rates modestly increase by 6.52 percentage points to an average of 51.31 percent, a classification of German respondents into different population clusters determined through their trust in the respective principal components on the basis of their socio-demographic and socio-economic characteristics only remains little better than a random guess with 33.33 percent and thus entirely unsatisfactory. Consequentially, target group-specific communication strategies should be regarded rather critically since they might fail to reach the intended target group as illustrated above.

In a final step, the respondents' intention to purchase chicken is estimated through the SPARTA II model which is based on the aforementioned population clusters. This measure is assumed to improve the derivation of an adequate response to a food safety incidence since addressing certain population clusters appears to be a less complex matter than addressing consumers solely according to their socio-economic characteristics. Moreover, trust no longer has a direct impact on the consumers' intention to purchase but influences the respondents' normative beliefs and their perception of risk. As in the previous section, estimates are conducted for a standard purchasing situation and the scenario of a hypothetical salmonella outbreak. As for pan-European observations, findings yield that the respondents' behavioural attitude is the crucial determinant for the intention to purchase. Only in the environment of a (hypothetical) food safety incidence perceived risk is another significant factor of influence. Moreover, German consumers generally appear to be more trustful regarding food safety information than their pan-European counterparts. Still, they react in a significantly more sensitive manner at the occurrence of a (hypothetical) food safety incidence. Recalling evidence from Böcker and Hanf's (2000) seminal paper on consumer responses to food scares and the Bayesian Revision Process illustrated in subchapter 3.3.5, the above-mentioned outcomes can also be formally confirmed: The higher the consumers' overall trust in food safety information, the higher is the extent of confidence loss in case of a food safety incidence.

6 Summary and Conclusions

The ever increasing number of food safety incidences in recent years has accentuated the need for an improved understanding of the motives behind consumers' reactions to random external shocks. Typically, such shocks trigger sudden and abrupt changes in consumer behaviour which – preconceiving contingent declines in consumption – may ceteris paribus culminate in severe welfare losses. Regardless of their fundamental significance, neoclassical microeconomic approaches often fail to explain these reactions which are evidently influenced by other than exclusively economic parameters. In order to allow for these conditions, the analysis of consumer behaviour under uncertainty is complemented through introducing the element of trust as a possible additional determinant.

As literature research suggests, incorporating the element of trust can be interpreted as a plausible strategy to reduce consumers' uncertainty in the context of decision making, most notably involving the purchase of goods possessing mainly credence qualities. For the purpose of ascertaining the impact of trust on consumer behaviour under uncertainty and discussing the conditions under which trust might be regarded as a market determinant, emphasis is placed on its conceptual and statistical evaluation under divergent scenarios. Precisely, this publication studies consumers' trust in selected sources of information and discusses the settings and extent to which it influences consumers' behaviour. Also, it is analysed whether different values of trust allow for deriving coherent cross national population segments and whether these can likewise be identified on the basis of consumers' socio-economic features. Lessons learnt from this recent field of research provide a valuable insight into consumer behaviour in the environment of a food safety incidence and could thus contribute to appropriate measures designed to safeguard consumers' trust.

The analysis of trust as a determinant of consumer behaviour under uncertainty comprehends a total of six chapters. Following the introduction, the second chapter outlines the classical principles of consumer theory which are completed by approaches from behavioural and information economics outlined in chapter three. Careful attention is paid to Ajzen's (1985) Theory of Planned Behaviour which provides a sound theoretical basis for investigating the effect of other than economic determinants on consumers' reactions. Both descriptive findings from a Europe-wide survey and statistical methods employed to determine consumers' trust are illustrated in chapter four. Moreover, chapter four also presents pan-European estimates concerning the impact of selected variables on the consumers' decision to conduct a specific

behaviour both in a standard situation and in the environment of a food safety incidence. With an emphasis on solely German consumers, these issues are reconsidered in chapter five, especially with regard to the question whether trust can be reliably assessed on the basis of socio-economic characteristics. Besides, chapter five expounds the problems of drawing an unambiguous conclusion based on the results of the empirical analyses.

Since the embedding of trust into economics is only little beyond its initial stage, a generally acceptable and methodologically sound concept had to be developed. The stepwise integration of additional determinants into the Theory of Planned Behaviour and the likewise consideration of consumers' socio-economic attributes resulted in the development of the so-called SPARTA model which allows for estimating the respective impact of trust and perceived risk on consumer behaviour under uncertainty. In an attempt to empirically assess this very behaviour, a pan-European survey was conducted among 2,725 respondents who were interviewed mostly in reference to their purchasing patterns and their confidence in different sources of information given a hypothesised salmonella infestation of poultry which was chosen as a familiar and popular product of frequent consumption. The collected data were analysed employing several standard univariate and multivariate statistical methods such as factor analyses, cluster analyses, and discriminant analyses.

As those techniques indicate, consumers' overall trust can be subdivided into five principal components, each representing a different category of information sources. The principal components determined comprise consumers' trust in information provided by media, food chain actors, both alternative and independent sources, and vested interests. The respective composition of these principal components reflects a high degree of congruence between European and German findings which alludes to a largely concordant evaluation of different suppliers of information across Europe. The subsequent identification of personality segments related to the particular trust placed upon the principal components yields a classification into three population clusters across which socio-economic characteristics appear to be well balanced. The composition of these clusters, however, considerably differs subject to regional distinctions and implicates a differentiation between the behaviour of European and German consumers. Whereas the data collected allows for characterising European consumers as being either trustful or distrustful, German consumers need to be portrayed as being either conservative or alternative trusters. Sceptic consumers are inherent in both groups.

Based on the specified population clusters, the consumers' intention to purchase poultry under altering circumstances is computed with reference to the SPARTA model. Estimates show that in a quotidian and presumably safe setting, the consumers' elementary attitude towards consuming poultry proves to be the crucial factor positively influencing the buying decision. Parameters like trust and perceived risk, in contrast, have negligible effects. In view of a food safety incidence, outcomes change to that effect that in addition to attitude, whose salient importance can again be confirmed, also trust and perceived risk prove to be decisive features of consumer behaviour under uncertainty. Modifications of the model attributed to a reinforced comprehension of population clusters as opposed to individuals verify this aspect. Since country-specific results are largely concordant, these conclusions similarly apply to European and German consumers.

With reference to the theoretical background which understands personality traits as equally constituting consumer behaviour, the commonly postulated causal interrelations between socio-economic characteristics of German consumers and their relative trust in diverse sources of information were evaluated. Variables were analysed in terms of their contribution to a prediction of the consumers' classification into predefined population classes. Among others, variables chosen for this purpose comprise the consumers' gender, their age, and their marital state. Unexpectedly, prognoses for both the prediction of consumers' overall trust in food safety information and the respective trust in single principal components turn out to be highly imprecise. Even though the overall success rate exceeds the expectancy value of a random guess, it has to be concluded that the chosen socio-economic criterions do not allow for drawing reliable conclusions with reference to classifying German consumers into population clusters exhibiting different levels of trust in diverse sources of information.

On the basis of these results, it can – in summary – be ascertained that irrespective of regional distinctions, consumers' trust in suppliers of information proves to be a crucial factor determining their behaviour under uncertainty. Attempts to reliably predict the very trust on the basis of socio-economic characteristics, however, did not yield satisfactory results. This leads to questioning the widespread practice of tailoring information campaigns with regard to consumers' socio-economic characteristics as distinctive features and furthermore implies an often incorrect approach to addressing consumers on behalf of decision makers. Instead of appealing to consumers in terms of socio-economic attributes such as their gender or age, for example, emphasis should preferably be placed on approaches directly addressing population

clusters according to their particular trustfulness which, as this publication has shown, is independent of the socio-economic variables selected.

As a result, it has to be remarked that the previously outlined results provide useful information for policy makers involved in understanding consumers' trust in any potentially unsafe good and their reactions to food safety incidences. Even though the analysis is restrained to an investigation of consumers' reactions in the environment of a hypothesised salmonella infestation of poultry, results are likely to be transferable to the occurrence of other random external shocks and might thus facilitate educing sustainable recommendations for adequate policy measures. For future investigations regarding the impact of trust on consumer behaviour under uncertainty, this publication might provide baseline information concerning the role of socio-economic factors in Germany. Still, an enhancement of the investigation evaluating to what extent these results might be generalised appears to be highly desirable. This, however, remains subject to further research.

7 German Summary

Die in den vergangenen Jahren sprunghaft gestiegene Zahl an Lebensmittelskandalen untermauert die Notwendigkeit eines verbesserten Verständnisses von Reaktionen der Verbraucher auf externe Schocks. Gemeinhin bewirken derartige Zwischenfälle unvermittelte Verhaltensänderungen, welche ceteris paribus zu einem Rückgang der nachgefragten Menge und folglich zu Wohlfahrtsverlusten führen. Ungeachtet ihrer grundsätzlichen Bedeutung für die Wirtschaftswissenschaften vermag die neoklassische mikroökonomische Theorie solche Reaktionen, denen nicht ausschließlich ökonomische Determinanten zugrunde liegen, nicht zufriedenstellend zu erklären. Um der Auswirkung jener Einflüsse dennoch Rechnung tragen zu können, wurde im Rahmen vorliegender Arbeit die Analyse des Verbraucherverhaltens bei Unsicherheit um *Vertrauen* als zusätzliche, erklärende Variable ergänzt. Nach einhelliger Meinung des Schrifttums ist Vertrauen aus der Perspektive der Konsumenten als eingängige Maßnahme zur Verringerung individueller Unsicherheit zu verstehen. Zur Bestimmung der Auswirkungen dieser Strategie auf das Verhalten der Konsumenten erfolgte zunächst eine Untersuchung der Ausprägung des Vertrauens in verschiedene Informationsquellen. Anschließend war zu analysieren, inwiefern sich auf Grundlage dieses Vertrauens länderübergreifende Bevölkerungssegmente abzeichnen, die möglicherweise ebenfalls anhand sozioökonomischer Charakteristika der Verbraucher zu identifizieren sind. Ergebnisse dieses vergleichsweise aktuellen Forschungsgebiets ermöglichen wertvolle Einblicke in das Verhalten der Verbraucher im Umfeld eines Lebensmittelskandals und tragen auf diese Art und Weise zu dem Ergreifen geeigneter Maßnahmen zur nachhaltigen Gewährleistung des Verbrauchervertrauens bei.

Die Analyse von Vertrauen als mögliche Determinante des Konsumentenverhaltens bei Unsicherheit umfasst sechs Kapitel. Nach allgemeiner Einführung in die Thematik wird im zweiten Kapitel ein umfassender Überblick über die Theorie des Konsumentenverhaltens präsentiert, die sodann im dritten Kapitel um verhaltens- und informationsökonomische Ansätze ergänzt wird. Besonderes Interesse gilt Ajzens Theorie des geplanten Verhaltens (1985), welche nach wesentlichen konzeptionellen Ergänzungen die theoretische Grundlage der Untersuchung bildet. Zwecks Überprüfung der in diesem Zusammenhang postulierten Vermutungen werden im vierten Kapitel Ergebnisse einer europaweiten Umfrage unter 2.725 Haushalten sowie Schätzungen des Einflusses ausgewählter Variablen auf das Verhalten der Verbraucher dargestellt. Analog zu dieser Vorgehensweise wird im fünften Kapitel das Verhalten deutscher Konsumenten dahingehend untersucht, inwieweit sich Vertrauen anhand

sozioökonomischer Kriterien verlässlich prognostizieren lässt. Die Arbeit schließt mit einer Zusammenfassung.

Wie vorliegende Arbeit zeigt, erweist sich in einer alltäglichen und vermeintlich sicheren Situation die *Einstellung* der Verbraucher gegenüber dem Konsum eines Produktes als ausschlaggebend für ihr Verhalten. Vertrauen kommt lediglich eine untergeordnete Bedeutung zu, die sich erst angesichts einer unterstellten Salmonellenkontamination von zu verwendendem Geflügelfleisch zu einem für das Verhalten der Verbraucher maßgeblichen Faktor wandelt, anhand dessen Ausprägung die Bestimmung inhärenter Hauptkomponenten und Bevölkerungscluster erfolgt. Während im Hinblick auf die Beschaffenheit der Hauptkomponenten ein länderübergreifend hohes Maß an Kongruenz zu konstatieren ist, deutet die ungleiche Zusammensetzung der Cluster auf Unterschiede zwischen dem Verhalten deutscher und anderer europäischer Verbraucher hin. So sind deutsche Verbraucher bezüglich des von ihnen Informationsquellen entgegengebrachten Vertrauens als entweder *konservativ* oder *alternativ*, europäische Verbraucher hingegen als entweder *vertrauend* oder *misstrauisch* zu charakterisieren. *Skeptische* Verbraucher finden sich in beiden Gruppen. Des Weiteren lässt sich zeigen, dass die oftmals postulierte Kausalität zwischen sozioökonomischen Merkmalen deutscher Verbraucher und deren Vertrauen in verschiedene Informationsquellen empirisch nicht nachzuweisen ist. Wider Erwarten kann demnach auf Grundlage sozioökonomischer Charakteristika der Konsumenten keine verlässliche Prognose ihrer Zugehörigkeit zu verschiedenen Bevölkerungsgruppen, die sich durch das Ausmaß ihres Vertrauens voneinander unterscheiden, erfolgen, was zwangsläufig die Frage nach dem ökonomischen Nutzen maßgeschneiderter Informationskampagnen aufwirft.

Abschließend bleibt festzuhalten, dass vorliegende Arbeit Vertrauen als europaweit maßgebliche Determinante des Konsumentenverhaltens bei Unsicherheit zu identifizieren vermochte. Wenngleich sich ökonomische Implikationen dieser Ergänzung der klassischen Nachfragetheorie erst in künftigen Forschungsarbeiten zu dem Verhalten der Konsumenten bei Unsicherheit niederschlagen werden, so bewirkt diese Arbeit ein generell intimeres Verständnis der Reaktionen von Verbrauchern auf externe Schocks. Dies stellt, nicht nur für Entscheidungsträger aus Wirtschaft und Politik, insofern eine wertvolle Hilfe dar, als so die Planung und Durchführung adäquater Maßnahmen zur Beeinflussung des Verhaltens der Konsumenten bei Unsicherheit maßgeblich erleichtert wird.

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Appendices

Appendix I – An Adaptive Model of Trust in Decision Making

Starting from equation 3.31, i.e.

$$\frac{(1-P_G)U_X^+ - U_Y}{(-1)U_X^-} > P_G = P_J P(G|A) + (1-P_J)P(G|B) \tag{3.31}$$

or

$$\frac{U_X^+ - P_G U_X^+ - U_Y}{(-1)U_X^-} > P_G = P_J P(G|A) + (1-P_J)P(G|B), \text{ respectively,} \tag{3.31}$$

a rearrangement yields

$$\frac{U_X^+ - U_Y}{(-1)U_X^-} > P_G - P_G\left(\frac{U_X^+}{U_X^-}\right). \tag{3.31b}$$

Expanding the respective fractions yields

$$\frac{U_X^+ - U_Y}{(-1)U_X^-} > P_G\left(\frac{U_X^- - U_X^+}{U_X^-}\right) \text{ and} \tag{3.31c}$$

$$\frac{U_X^+ - U_Y}{(-1)U_X^-} > P_G\left(1 - \frac{U_X^+}{U_X^-}\right), \text{ respectively.} \tag{3.31d}$$

Since U_X^- assumingly is clearly larger than U_X^+, $\frac{U_X^+}{U_X^-}$ tends to zero which thus yields

$$\frac{U_X^+ - U_Y}{(-1)U_X^-} > P_G. \tag{3.31e}$$

Finally, replacing P_G through equation 3.25 yields

$$\frac{U_X^+ - U_Y}{(-1)U_X^-} > P_J P(G|A) + (1-P_J)P(G|B). \tag{3.32}$$

Appendix II – Additional Explanatory Tables

Table 4.36 Estimates of the SPARTA Model in the environment of a salmonella outbreak

Determinants	**EU**	**UK**	**FRA**	**ITA**	**NED**	**GER**
Constant	-1.07***	1.02	2.77**	0.04	-6.12***	-3.09***
Age					1.78***	
Education		-0.36**		-1.58**	1.52**	
Children	0.66*		0.79**			2.03***
Income				2.13***		
Town Size			-2.34***			1.52**
Subjective Norm	0.05**	-0.24*	-0.21*	0.18***	0.02	0.03
Education		0.07*				
Town Size			0.12*			
Perceived Behavioural Control	0.04*	-0.02	-0.01	0.22*	-0.10	0.13
Age					-0.44***	
Children			-0.29**			
Income				-0.18***	0.52***	
Attitude	0.21***	0.16**	-0.20	-0.10	1.01***	0.53***
Education			-0.04	0.26**	-0.17*	
Children	-0.12*				-0.40***	-0.35***
Income				-0.28***		
Town Size			0.29***			-0.22*
Risk Perception	-0.08***	-0.02	-0.38	-0.34***	0.46**	-0.09
Education			0.09**		-0.16**	
Income				0.12***		
Trust in Media	-0.04	-0.13**	0.12	-0.13*	-0.23**	0.10
Age			-0.14**			
Trust in Food Chain	0.02	0.02	0.66***	0.73***	0.01	-0.13
Age			-0.17***			0.15**
Town Size			-0.20**	-0.47***		
Trust in Public Authorities	0.04	-0.13**	-0.08	0.28	-1.00*	-0.02
Age						0.18***
Education					0.31**	
Children					0.75***	
Income				0.22***	-0.26***	
Town Size				-0.41**		
Doctors and Scientists	-0.02	-0.60***	0.04	0.11	0.01	-0.10
Education		0.20***		-0.22**		
Income				0.29***		
Trust in Alternative Sources	-0.09***	-0.07	-0.09	0.67***	-0.06	-0.05
Town Size				-0.47***		-0.32**
Chi-Square	106.1**	32.9***	64.2***	79.9***	72.8***	110.8**
Log-likelihood	-3,018.1	-524.82	-478.66	-356.06	-325.94	-634.59
Correct Predictions	0.40	0.27	0.46	0.49	0.40	0.39
Correct Predictions(§)	0.62	0.55	0.67	0.68	0.53	0.67

Note: Asterisks such as *** indicate significance at the one percent level, ** indicate significance at the five percent level, and * indicates significance at the ten percent level. Source: Modified from Mazzocchi et al., 2005b, p. 20. The symbol (§) indicates the correct predictions after a reclassification of the respondents' statements into three categories instead of seven as attributed to the seven-point Likert scale.

Table 5.20 Standardised Canonical Discriminant Function Coefficients

	Discriminant Function	
	1	2
Food Chain Actors		
Gender	0.275	-0.145
Age	0.508	0.190
Marital State	-0.862	0.399
Persons in the Household	0.310	0.695
Number of Children	-0.128	-0.338
Gross Annual Income	0.309	0.395
Status of Employment	0.410	0.186
Level of Education	0.296	0.036
Media		
Gender	0.231	0.042
Age	0.343	-0.194
Marital State	-0.372	-0.702
Persons in the Household	1.130	-0.249
Number of Children	-0.652	0.441
Gross Annual Income	0.068	0.593
Status of Employment	-0.231	-0.197
Level of Education	0.829	0.303
Independent Sources		
Gender	0.268	-0.152
Age	0.479	-0.147
Marital State	-0.226	0.417
Persons in the Household	0.664	-0.240
Number of Children	0.059	0.703
Gross Annual Income	-0.657	0.506
Status of Employment	-0.389	-0.215
Level of Education	0.218	0.369
Vested Interests		
Gender	0.401	0.511
Age	0.086	-0.081
Marital State	0.069	0.088
Persons in the Household	-0.171	-0.514
Number of Children	-0.372	0.410
Gross Annual Income	-0.211	0.646
Status of Employment	0.316	-0.639
Level of Education	0.629	0.000
Alternative Sources		
Gender	-0.129	0.547
Age	0.094	-0.198
Marital State	-0.633	0.263
Persons in the Household	-0.394	-0.354
Number of Children	0.678	0.012
Gross Annual Income	0.447	-0.203
Status of Employment	0.164	0.633
Level of Education	0.600	-0.006

Table 5.21 Structure Matrix

	Discriminant Function	
	1	2
Food Chain Actors		
Status of Employment	0.428*	0.307
Level of Education	0.225*	0.097
Marital State	-0.531	0.700*
Persons in the Household	-0.031	0.650*
Gross Annual Income	0.365	0.529*
Age	0.223	0.470*
Number of Children	-0.007	0.422*
Gender	0.298	-0.366*
Media		
Level of Education	0.715*	0.048
Persons in the Household	0.394*	-0.193
Status of Employment	0.298*	-0.099
Number of Children	0.092*	0.060
Marital State	0.134	-0.696*
Gross Annual Income	0.090	0.518*
Age	0.330	-0.443*
Gender	0.092	0.223*
Independent Sources		
Persons in the Household	0.588*	0.487
Age	0.278*	0.072
Status of Employment	-0.252*	-0.193
Number of Children	0.497	0.595*
Gross Annual Income	-0.518	0.535*
Marital State	0.091	0.530*
Level of Education	0.037	0.365*
Gender	0.073	-0.268*
Vested Interests		
Level of Education	0.627*	0.014
Persons in the Household	-0.557*	-0.256
Number of Children	-0.490*	-0.064
Gender	0.487*	0.478
Status of Employment	0.249	-0.522*
Gross Annual Income	-0.270	0.484*
Age	-0.016	-0.029*
Marital State	-0.016	0.023*
Alternative Sources		
Level of Education	0.579*	0.135
Marital State	-0.452*	-0.124
Gross Annual Income	0.423*	-0.282
Status of Employment	0.219	0.653*
Gender	0.085	0.641*
Persons in the Household	0.003	-0.415*
Age	-0.107	-0.344*
Number of Children	0.240	-0.278*

Table 5.22 Classification Results

Target Variable		Predicted Group Membership			
		1	2	3	Total
Food Chain Actors					
Count	1	0	18	5	23
	2	0	79	21	100
	3	0	51	25	76
%	1	0.00	78.26	21.74	100.00
	2	0.00	79.00	21.00	100.00
	3	0.00	67.11	32.89	100.00
Media					
Count	1	3	16	3	22
	2	1	84	15	100
	3	1	61	15	77
%	1	13.64	72.73	13.64	100.00
	2	1.00	84.00	15.00	100.00
	3	1.29	79.22	19.48	100.00
Independent Sources					
Count	1	1	16	7	24
	2	1	80	19	100
	3	0	51	25	76
%	1	4.16	66.67	29.16	100.00
	2	1.00	80.00	19.00	100.00
	3	0.00	67.11	32.89	100.00
Vested Interests					
Count	1	0	30	1	31
	2	0	94	6	100
	3	0	65	3	68
%	1	0.00	96.77	3.23	100.00
	2	0.00	94.00	6.00	100.00
	3	0.00	95.59	4.41	100.00
Alternative Sources					
Count	1	0	13	9	22
	2	1	82	17	100
	3	0	57	20	77
%	1	0.00	59.09	40.91	100.00
	2	1.00	82.00	17.00	100.00
	3	0.00	74.03	25.97	100.00

Rounding errors may occur.

Appendix III – Questionnaire

Introduction

This project, supported by public funding from the European Commission, is a Europe-wide investigation of issues surrounding the food supply chain, especially focusing on chicken consumption.

This survey has three sections and will take approximately 30 minutes to complete. Please note that there are no right or wrong answers to the questions. We are simply interested in your opinions.

Please be assured all answers will be kept strictly confidential, your anonymity protected and that your responses will be used only for the purposes of this research.

Thank you very much for your time and input.

Section 1

1. How many people do you regularly buy food for home consumption (including yourself)? _____

2. In a typical week, how often do you buy…

Tick the box that best represents your answer.

	Never (0)	**Not every week** (1)	**Once** (2)	**Twice** (3)	**Three times** (4)	**Four times** (5)	**More than four times** (6)
Food for your household's home consumption							
Any type of chicken for your household's home consumption							
Fresh chicken							
Frozen chicken							
Chicken as part of a prepared meal							
Cooked chicken							
Processed chicken							
Chicken as a meal outside your home							

3. How many vegetarians or vegans are there in your household?

□ None □ One □ Two □ Three
□ Four □ Five □ More

If you 'Never' buy chicken OR you don't buy fresh or frozen chicken for your household please proceed to question 9 directly.

4. In a typical week, about how much *fresh or frozen* chicken do you buy for your household's home consumption? _____ (kgs)

5. In a typical week, about how much do your household approximately spend on *fresh or frozen* chicken for your household's home consumption? _____ (Euros)

6. In a typical week, what type of *fresh or frozen* chicken do you buy for your household's home consumption?

Tick the most applicable, tick only 1.

I don't know	
'Value' chicken	
'Standard' chicken	
'Organic' chicken	
'Luxury' chicken	

7. How likely or unlikely is it that you will buy *fresh or frozen* chicken for your household's home consumption at least once in the next week?

   Circle the number that best reflects your response.

extremely unlikely			**neither**			**extremely likely**
1	2	3	4	5	6	7

8. In a typical week where do you purchase your *fresh* or *frozen* chicken?

   Please mark all that apply!

Discount supermarket	
Supermarket	
Local shop	
Butcher	
Farmer	
Market	
Online shopping/home delivery	

□ Other (please specify)_____

Please answer all remaining questions regardless of whether you buy chicken for your household or not.

Circle the number that best reflects your opinion.

9. In my household we like chicken:

completely disagree			**neither**			**completely agree**
1	2	3	4	5	6	7

10. A good diet should include chicken:

completely disagree			**neither**			**completely agree**
1	2	3	4	5	6	7

11. Personally, I think that buying chicken for my household is:

Circle the response that best reflects your opinion.

Good	1	2	3	4	5	6	7	Bad
Disagreeable	1	2	3	4	5	6	7	Agreeable
Convenient	1	2	3	4	5	6	7	Inconvenient
Ethical	1	2	3	4	5	6	7	Unethical

12. My decision whether or not to buy chicken next week is based on the fact that:

Circle the response which best reflects your opinion.

		Completely Disagree			**Neither**			**Completely Agree**	**I don't know (0)**
A	Chicken tastes good	1	2	3	4	5	6	7	□
B	Chicken is good value for money	1	2	3	4	5	6	7	□
C	Chicken is not easy to prepare	1	2	3	4	5	6	7	□
D	Chicken is a safe food	1	2	3	4	5	6	7	□
E	All the family likes chicken	1	2	3	4	5	6	7	□
F	Chicken works well with lots of other ingredients	1	2	3	4	5	6	7	□
G	Chicken is low in fat	1	2	3	4	5	6	7	□
H	Chicken is low in cholesterol	1	2	3	4	5	6	7	□
I	Chicken lacks flavour	1	2	3	4	5	6	7	□
J	Buying chicken helps the local farmers and economy	1	2	3	4	5	6	7	□
K	I do not like the idea of chickens being killed for food	1	2	3	4	5	6	7	□
L	Chicken is not produced taking into account animal welfare	1	2	3	4	5	6	7	□

13. Which of the reasons, listed in question 12 above, are the MOST important to you when buying chicken?

Please list no more than three (3) reasons using the letter that corresponds to the statement/s you feel to be the MOST important to you.

Importance	**Reason**
1	
2	
3	

14. Others' opinions about chicken are important to me.

not important at all			**neither**			**extremely important**
1	2	3	4	5	6	7

15. I take others' opinions into account when making decisions about whether or not to buy chicken.

completely disagree			**neither**			**completely agree**
1	2	3	4	5	6	7

16. Other people suggest chicken in the diet is?

very bad			**neither**			**very good**
1	2	3	4	5	6	7

17. Please rate the risk of any one person in your household suffering from the following as a result of eating chicken.

Circle the best response.

Risk from:	**I don't know$_{(0)}$**	**Negligible**						**Extremely high**
Escherichia Coli	□	1	2	3	4	5	6	7
Salmonellae	□	1	2	3	4	5	6	7
Listeria	□	1	2	3	4	5	6	7
Allergy from food additives	□	1	2	3	4	5	6	7

18. Please rate the risk of any one person in your household experiencing long-term health problems due to eating chicken.

Circle the best response.

Risk from:	**I don't know$_{(0)}$**	**Negligible**						**Extremely high**
Cholesterol	□	1	2	3	4	5	6	7
Health problems from pesticides	□	1	2	3	4	5	6	7
Health problems from antibiotics	□	1	2	3	4	5	6	7
Health problems from growth hormones	□	1	2	3	4	5	6	7
Chicken flu	□	1	2	3	4	5	6	7

19. Assume that you have just discovered by reading an article in the newspaper that high rates of salmonella in chicken have been found in your area. Several people have been hospitalized as a result.

    How likely or unlikely is it that you will buy *fresh or frozen* chicken for your household's home consumption at least once next week?

Circle the number that best reflects your response.

Extremely unlikely			**Neither**			**Extremely likely**
1	2	3	4	5	6	7

20. Please state your level of agreement with the following sentences.

Circle the number that best reflects your opinion.

	Completely Disagree			**Neither**			**Completely Agree**
I typically store chicken in my freezer	1	2	3	4	5	6	7
We eat too much chicken	1	2	3	4	5	6	7

	Extremely unlikely			**Neither**			**Extremely likely**
Let's say you do have some chicken in your freezer. Is it likely you would buy more next week?	1	2	3	4	5	6	7
Let's say last week you ate a lot of chicken. Is it likely you would not buy chicken at all next week?	1	2	3	4	5	6	7

21. Generally, safe chicken is:

	Completely Disagree						**Completely Agree**	**I don't know (0)**
Packaged	1	2	3	4	5	6	7	□
Clearly labelled	1	2	3	4	5	6	7	□
Whole chicken	1	2	3	4	5	6	7	□
From the butcher	1	2	3	4	5	6	7	□
From the supermarket	1	2	3	4	5	6	7	□
Produced in Britain	1	2	3	4	5	6	7	□
Produced in the EU	1	2	3	4	5	6	7	□
Produced in Asia	1	2	3	4	5	6	7	□
Expensive	1	2	3	4	5	6	7	□
Free range, organic or corn-fed	1	2	3	4	5	6	7	□
Recognizable by colour, taste or smell	1	2	3	4	5	6	7	□
Fresh	1	2	3	4	5	6	7	□

Section 2

22. In general, how much do you know about the risks associated with the following items in food?

	Not at all knowledgeable						**Extremely knowledgeable**
Escherichia-Coli	1	2	3	4	5	6	7
Salmonellae	1	2	3	4	5	6	7
Listeria	1	2	3	4	5	6	7
Cholesterol	1	2	3	4	5	6	7
Allergy from food additives	1	2	3	4	5	6	7
Health problems from pesticides	1	2	3	4	5	6	7
Health problems from antibiotics	1	2	3	4	5	6	7
Health problems from growth hormones	1	2	3	4	5	6	7
Chicken flu	1	2	3	4	5	6	7

23. To what extent do you think you can reduce the risk associated with food safety by taking any appropriate action, such as cooking thoroughly; handling the food; storing the food properly; choice of the retails outlet; purchasing higher quality products etc.?

To a minimal extent			**neither**			**to a large extent**
1	2	3	4	5	6	7

24. In general, how important are each of the following to your household?

Circle the response that best reflects your opinion.

	Extremely Unimportant			**Neither**			**Extremely Important**
Tasty food	1	2	3	4	5	6	7
Value for money	1	2	3	4	5	6	7
Ease of preparation	1	2	3	4	5	6	7
Food safety	1	2	3	4	5	6	7
Food that everyone likes	1	2	3	4	5	6	7
Variety in our meals	1	2	3	4	5	6	7
Fat content	1	2	3	4	5	6	7
Cholesterol content	1	2	3	4	5	6	7
Ethical food production methods	1	2	3	4	5	6	7
Local community livelihood	1	2	3	4	5	6	7
Animal welfare	1	2	3	4	5	6	7

25. Please indicate the extent to which you agree or disagree with each of the statements you find below by circling the number that most closely describes your personal view.

	Completely Disagree			**Neither**			**Completely Agree**
I like foods from different countries	1	2	3	4	5	6	7
Ethnic food looks too weird to eat	1	2	3	4	5	6	7
I like to try new ethnic restaurants	1	2	3	4	5	6	7
I like to purchase the best quality food I can afford	1	2	3	4	5	6	7
At parties, I will try a new food	1	2	3	4	5	6	7
I am constantly sampling new and different foods	1	2	3	4	5	6	7
I don't trust new foods	1	2	3	4	5	6	7
I will eat almost anything	1	2	3	4	5	6	7
If I don't know what is in a food, I won't try it	1	2	3	4	5	6	7
I am afraid to eat things I have never eaten before	1	2	3	4	5	6	7

26. Please indicate the extent to which you agree or disagree with each of the statements you find below by circling the number that most closely describes your personal view.

	Completely Disagree			**Neither**			**Completely Agree**
I usually aim to eat natural foods	1	2	3	4	5	6	7
I am willing to pay more for a better quality product	1	2	3	4	5	6	7
Quality is decisive for me when purchasing foods	1	2	3	4	5	6	7
I always aim for the best quality	1	2	3	4	5	6	7
When choosing foods, I try to buy products that do not contain residues of pesticides or antibiotics	1	2	3	4	5	6	7
I am willing to pay more for foods containing natural ingredients	1	2	3	4	5	6	7
For me, wholesome nutrition begins with the purchase of high quality foods	1	2	3	4	5	6	7

27. How would you rate these activities in terms of risk to health?

Risk from:	**Negligible**						**Extremely high**
Smoking cigarettes	1	2	3	4	5	6	7
Driving	1	2	3	4	5	6	7
Eating beef	1	2	3	4	5	6	7
Eating chicken	1	2	3	4	5	6	7
Taking illegal drugs	1	2	3	4	5	6	7
Scuba diving	1	2	3	4	5	6	7
Swimming	1	2	3	4	5	6	7

28. Regarding the scale below, what do you think describes you best?

I am a risk taker			**Neither**			**I avoid taking risks**
1	2	3	4	5	6	7

29. Regarding contingent risks for your health, how would you judge the following foods?

	very risky			**neither**			**not risky**
Lamb	1	2	3	4	5	6	7
Pork	1	2	3	4	5	6	7
Chicken	1	2	3	4	5	6	7
Beef	1	2	3	4	5	6	7
Prepared meals	1	2	3	4	5	6	7
Fish	1	2	3	4	5	6	7
Eggs	1	2	3	4	5	6	7
Dairy	1	2	3	4	5	6	7
Fruit and vegetables	1	2	3	4	5	6	7
GM foods	1	2	3	4	5	6	7
Organic foods	1	2	3	4	5	6	7

30. Assume that you were preparing chicken for dinner when you suddenly remembered that you had read an article in the newspaper yesterday which reported that there were particularly high rates of salmonella found in poultry in your area. As a result, several people had been hospitalized. You cannot remember which type of poultry (e.g. turkey or chicken etc) the article was referring to – where do you go for further information?

    Please mark all that apply!

A	Television	
B	Newspapers	
C	Internet	
D	Radio	
E	Magazines	
F	Your supermarket or store	
G	Consumer organisations	
H	Government	
I	Family/friends	
J	I would not bother to find anymore information	
K	Other (please state)	

31. Which of these (listed in Question 30 above) are the MOST important to you?

    Please list no more than three (3) using the letter that corresponds to the information source/s which you feel to be the MOST important to you.

Importance	Source
1	
2	
3	

32. Assume that you saw a report on the incidence of salmonella in chicken from a specific supplier on the television last night. You remember that the store you shop at stocks chicken from this supplier. Whom would you inform?

    Please mark all that apply!

A	Your supermarket or store	
B	Consumer organisation	
C	Friends/family	
D	Local health authority	
E	All your email contacts	
F	I would not inform anyone	
G	Other (please specify)	

33. Which of these (listed in question 32 above) would you attach the MOST importance to informing?

Please list no more than three (3) using the letter that corresponds to the MOST important of these.

Importance	Persons/Organisation
1	
2	
3	

34. Have you actively searched for any information on food safety in the last two weeks?

Yes (1) No (0)

Please tick the most applicable!

35. How many hours per day do you watch TV?

I do not watch TV	More than 2 and up to 4 hours	More than 6 hours
Up to 2 hours	More than 4 and up to 6 hours	I do not know

36. How many hours per day do you listen to the radio?

I do not listen to radio	More than 2 and up to 4 hours	More than 6 hours
Up to 2 hours	More than 4 and up to 6 hours	I do not know

37. How many hours per day do you surf the internet?

I do not surf the internet	More than 2 and less than 4 hours	More than 6 hours
Up to 2 hours	More than 4 and less than 6 hours	I do not know

38. How many different newspapers do you read in a typical week?

I do not read newspapers	More than 2 and up to 4	More than 6
Up to 2	More than 4 and up to 6	I do not know

For questions 39 - 42 please tick only one response for each question.

39. How many relatives influence your food purchasing decisions?

- □ None
- □ One
- □ Two
- □ Three
- □ Four
- □ Five
- □ More (please specify) _____
- □ Not applicable

40. Which relatives' opinions do you value most?
    - None
    - Parents
    - Partner/wife/husband
    - Sister/brother
    - Grandmother/grandfather
    - Daughter/son
    - Other
    - All
    - Not applicable

41. How many friends influence your food purchasing decisions?
    - None
    - One
    - Two
    - Three
    - Four
    - Five
    - More (specify) _____
    - Not applicable

42. How many colleagues influence your food purchasing decisions?
    - None
    - One
    - Two
    - Three
    - Four
    - Five
    - More (please specify) _____
    - Not applicable

43. Suppose that each of the following has provided information about potential risks associated with salmonella in food. Please indicate to what extent you would trust that information.

	Completely Distrust			**Neither**			**Completely Trust**	**I don't know (0)**
Shopkeepers	1	2	3	4	5	6	7	□
Supermarkets	1	2	3	4	5	6	7	□
Organic shop	1	2	3	4	5	6	7	□
Specialty store	1	2	3	4	5	6	7	□
Farmers / breeders	1	2	3	4	5	6	7	□
Processors	1	2	3	4	5	6	7	□
Doctors / health authority	1	2	3	4	5	6	7	□
University scientists	1	2	3	4	5	6	7	□
National authority in charge of food safety	1	2	3	4	5	6	7	□
Government	1	2	3	4	5	6	7	□
Political groups	1	2	3	4	5	6	7	□
Environmental organisations	1	2	3	4	5	6	7	□
Animal welfare organisations	1	2	3	4	5	6	7	□
Consumer organisations	1	2	3	4	5	6	7	□
European Union authority in charge of food safety	1	2	3	4	5	6	7	□
Television documentary	1	2	3	4	5	6	7	□
Television news / current affairs	1	2	3	4	5	6	7	□
Television adverts	1	2	3	4	5	6	7	□
Newspapers	1	2	3	4	5	6	7	□
Internet	1	2	3	4	5	6	7	□
Radio	1	2	3	4	5	6	7	□
Magazines	1	2	3	4	5	6	7	□
Product label	1	2	3	4	5	6	7	□

44. Suppose on Monday, someone tells you about a food safety incident that may potentially affect people living in your area.

    (a). How many more people, in your area, do you think will have heard about this incident by Wednesday?

    - □ No one
    - □ Less than half the people
    - □ About half the people
    - □ More than half the people
    - □ Everyone

(b). How many by Sunday?

- □ No one
- □ Less than half the people
- □ About half the people
- □ More than half the people
- □ Everyone

45. Please assume that you hear rumours about a food safety incident. Regarding the respective pairs, whom do you trust more?

Whom do you trust MORE?				
□	Family	or	□	University scientist
□	Family	or	□	Public authorities
□	Family	or	□	Media
□	Family	or	□	Producers
□	University scientist	or	□	Public authorities
□	University scientist	or	□	Media
□	University scientist	or	□	Producers
□	Public authorities	or	□	Media
□	Public authorities	or	□	Producers
□	Media	or	□	Producers

46. Which of the following suppliers do you consider to be trustworthy? If you were to assign the MOST trustworthy supplier a value of 10, what are the values you would give to other suppliers?

a). Organic Farmers

No trust at all	**half as much trust**	**complete trust**
0	5	10

b). Conventional Farmers

No trust at all	**half as much trust**	**complete trust**
0	5	10

c). Industrial Poultry Breeders

No trust at all	**half as much trust**	**complete trust**
0	5	10

d). Brand Producers

No trust at all	**half as much trust**	**complete trust**
0	5	10

47. Please answer the following:

	Completely Disagree			Neither			Completely Agree
If given a chance, most people would try to take advantage of you	1	2	3	4	5	6	7
Most people are too busy looking out for themselves to be helpful	1	2	3	4	5	6	7
You can't trust strangers anymore	1	2	3	4	5	6	7
I never rely on other people	1	2	3	4	5	6	7

48. Food production and retailing has undergone significant changes in recent years, in agricultural techniques, food processing, trade and so on. Considering these issues, do you think that the quality of food you and your household eat is:

Much worse			**The same**		**Much better**		**I don't know**
1	2	3	4	5	6	7	□

49. How do you rate your ability to assess food quality and safety?

Very poor			Neither		Very good		**I don't know**
1	2	3	4	5	6	7	□

Section 3

In this part of the survey, we kindly request some background information about you, as it is a critical part of our analysis. This is an anonymous survey and your name is in no way linked to the responses. In addition, all of this information will be treated as confidential. Results of the survey will only be used in aggregate form and only for research purposes.

50. Your gender: Female Male

51. Your age: _____

52. Marital status: Single Married Other

53. What is the highest level of education you have completed?

No formal education	Higher secondary school
Primary school	Tertiary education (non university degree)
Lower secondary school	University degree

54. Please indicate your employment status.

Employed full-time	Employed part-time
Unemployed	Student
Retired	Household keeper

55. What is your occupation?

I am not employed	Self-employed professional
Non-manual employee	Farmer / agricultural worker
Manual employee	Employer / Entrepreneur
Executive	Other

56. Number of people currently living in your household (including yourself):_____

57. If you have children in your household how many children in each age bracket?

a). None b). Less than 3 years ____c). 3-10 years____ d). 11-16 years____
e).Elder than 16 years ____

58. Are there other members of the household who are dependant on you (e.g. elderly or disabled)?

a). Yes No
b). If Yes, how many?_____

59. On average, how much does your household spend on food each week? (In € or £)

Less than 45	45-74.99	75-119.99
120-150	More than 150	

60. Please indicate your gross annual household income range. (In € or £)

Less than 15 000	30 000-44 999	60 000-89 999	More than 120 000
15 000-29 999	45 000-59 999	90 000-120 000	No response

61. How would you describe the financial situation of your household?

Not very well off	Difficult	Modest	Reasonable	Well off

62. Do you belong to any consumer or environmental organizations?

a). Yes No

b). If yes, which one/s? _____

Curriculum Vitae

Personal Dates

Name	Leef H. Dierks
Date of Birth	December 25th, 1977 in Kiel, Germany

Dissertation

2003 – 2005	Cooperation in the European Commission's Research Project Food Risk Communication and Consumers' Trust in the Food Supply Chain at the Institute for Agricultural Economics at the Christian-Albrechts-University at Kiel, Germany

University

1997 – 2003	Studies of Business Administration and Economics at the Christian-Albrechts-University at Kiel, Germany; Graduation as Diplom-Kaufmann and Diplom-Volkswirt
2000	Studies of Business Administration and Economics at the Universidad Torcuato Di Tella in Benos Aires, Argentina

Education

1994 – 1997	German School Alexander von Humboldt, Mexico City, Mexico
1990 – 1994	Käthe-Kollwitz-Gymnasium, Kiel, Germany
1987 – 1990	German School Pretoria, Pretoria, South Africa
1984 – 1986	Dörfergemeinschaftsschule Felde, Felde, Germany