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.
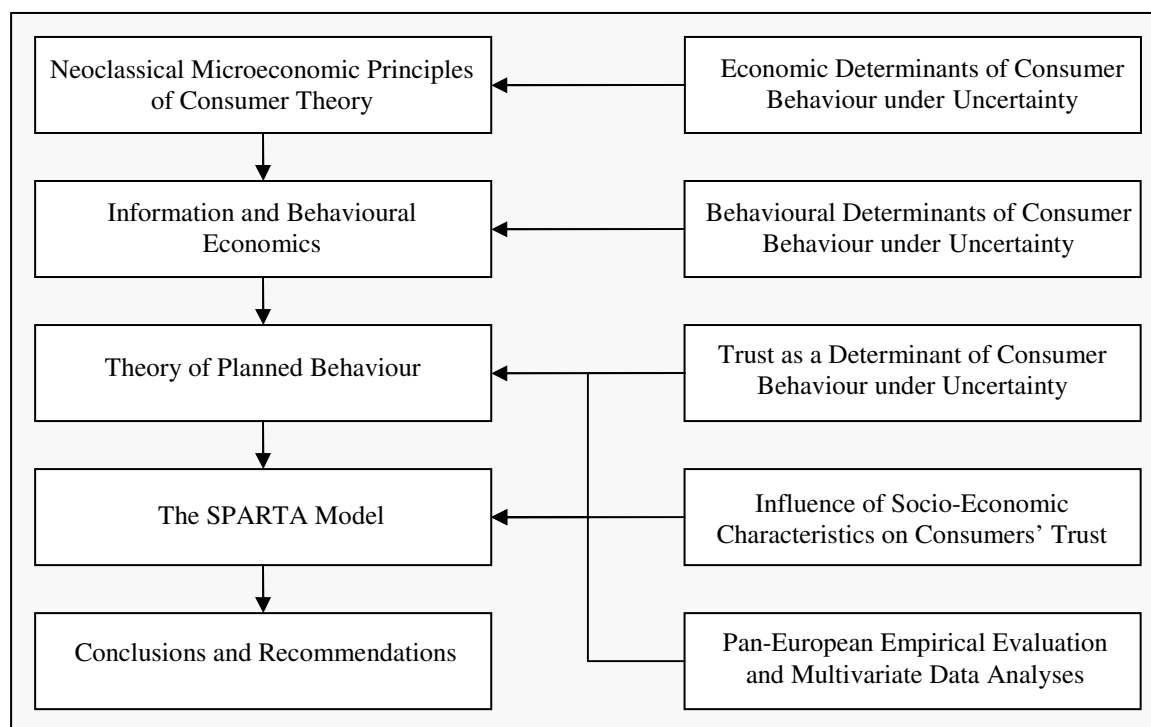

Figure 1.1 Structure of the Research Project

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 $f : \Re \rightarrow \Re$, $v(x) = f(u(x))$ 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 ≥ y *or* y ≥ x *or both.*
- Reflexivity – *for all* x *in X,* x ≥ x.
- Transitivity – *for all* x, y *and* z *in X, if* x ≥ y *and* y ≥ z, *then* x ≥ z.
- Continuity – *for all* y *in X, the sets* $\{x : x \geq y\}$ *and* $\{x : x \leq y\}$ *are closed sets. It follows that* $\{x : x \succ y\}$ *and* $\{x : x \prec y\}$ *are open sets.*
- Strong Monotonicity – *if* x ≥ y *and* x ≠ y, *then* x ≻ 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 recast 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.