

Economic Valuation of Farm Animal Welfare

Exploring Consumer Preferences and Willingness-to-Pay for the Welfare of Broilers in Germany

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Abstract

Estimating the value consumers place on farm animal welfare (FAW) provides information on the extent to which consumers are ready to support policy changes aim at improving the welfare of farm animals and developing animal-friendly production systems that can also compete on markets. The current study focused on the welfare of broilers, which was chosen due to its very intensive nature as well as the small shares of alternative broiler production systems in German markets in comparison with other types of farm animals or with other European countries. The welfare problems of broilers in the conventional production system are caused by many reasons such as selective breeding for rapid growth, high stocking density, intensive feeding programs, and long transit periods.

Based on such background, the study aimed at exploring consumer preferences and willingness-to-pay (WTP) for a certified FAW product, namely broiler meat, using the contingent valuation method. The label “FAW-certified” implies that the product has been produced under conditions which are in compliance with the welfare needs of respective animals. In addition, the study used the choice experiment method to investigate how consumers value different FAW attributes and alternative broiler production systems, including outdoor and extensive indoor systems. The choice experiment design was based on three process attributes: (a) outdoor access possibility and age of birds at slaughter, (b) the stocking density, and (c) conditions during transport and slaughter. These attributes were studied at different levels reflecting different welfare standards by asking consumers to make trade-offs among a number of hypothetical production scenarios.

The data was obtained from a survey of 300 German broiler consumers using face-to-face interviews. The results of the contingent valuation showed that 82% of the respondents were ready to buy certified FAW products. A majority of these (95%) were willing to pay an extra sum of about €1.5 for 1 kg of “FAW-certified” broiler fillets, which represents a price increase of about 27% in comparison with the actual price of conventional broiler fillets.

The choice experiment findings revealed that all FAW attributes had a positive effect on consumers' choices with an increased probability of choosing an alternative product when giving broilers outdoor access with slower growth rate, decreasing stocking density, and improving conditions of transport and slaughter, respectively. Consumers were found to be heterogeneous in their preferences for broiler welfare attributes. The WTP estimates showed that consumers were more likely to pay significantly higher prices for alternatively produced broilers relative to the conventional product.

In conclusion, both the contingent valuation and the choice experiment results confirm that there is a potential for raising the welfare standards of broilers in Germany. This suggests that policy changes towards high welfare levels are strongly supported by consumers and calls policy makers and the chicken industry to diversify broiler production methods and shift to more welfare-friendly methods.

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Chapter 1

Introduction

“Sustainable agriculture must be sustainable for the animals too”
(CIWF 2008)

1. Background

Over the last 50 years, the structure of farming practices in developed countries has been transformed from family and small-scale farming to factory and large-scale farming. This industrialization process emerged due to the predominant tendency of agriculture for efficiency by maximizing productivity and minimizing costs. Factory farming has been able to provide cheap food to society on the one hand but many associated problems as well on the other hand (WSPA 2007). One of these problems is the negative effect of the high degree of production intensification on the welfare of farm animals.

Farm animals are one of the economic resources used by man to produce raw materials. Marggaf and Streb (1997: 27) have categorized animals as environmental goods (consumption goods). Like other environmental goods, farm animals have an economic value (use value) equal to their contribution to the total economic output; and a non-use value placed by people on their welfare (well-being), which is derived from knowing that animals used for economic purposes are being treated in an appropriate manner (McInerney 2004). Therefore, conserving and using this resource in a sustainable way is considered highly significant as an ethical and moral issue.

Ethical considerations for the issue of farm animal welfare (FAW) have become important for consumers, producers, and policy makers particularly over the last 15-20 years (Bennett and Larson 1996). The concern about FAW had been first recognized in England in 1964 by Ruth Harrison in her book “Animal Machines”, where she criticized the cruel and unacceptable modern animal production practices (Harrison 1964). In the following year, a British technical committee issued a report suggesting the most basic

welfare needs of animals (Brambell 1965). The Brambell report stressed that animals require the freedoms to stand up, lie down, turn around, stretch their limbs, and make normal postural adjustment.

Later, many researchers and organizations provided definitions of animal welfare. The most common definition “*the welfare of an animal is its state as regards its attempts to cope with its environment*” was stated by Broom (1986). The United Kingdom (UK) Farm Animal Welfare Council (FAWC) defined clear principles of FAW in terms of five freedoms (FAWC 1993), namely:

1. Freedom from hunger and thirst - by ready access to fresh water and a diet to maintain full health and vigor.
2. Freedom from discomfort - by providing an appropriate environment including shelter and a comfortable resting area.
3. Freedom from pain, injury or disease - by prevention or rapid diagnosis and treatment.
4. Freedom to express natural behavior - by providing sufficient space, proper facilities, and company of the animal’s own kind.
5. Freedom from fear and distress - by ensuring conditions and treatment which avoid mental suffering

Moreover, Webster (2001) referred to good welfare as the ability of the animal to “*sustain fitness and avoid suffering*”. In general, FAW definitions agree that man should ensure good quality of life for animals and humane transport and death.

This interest in how farm animals are treated and man’s obligations to consider FAW in food production has led to the fact that FAW has become a considerable issue in the agricultural policy of the European Union (EU). However, efforts to ensure and improve FAW by the EU and many FAW organizations are still facing huge challenges. The main challenge is how to apply FAW aspects without affecting profitability of the different food chain actors. In addition, the complexity of improving FAW is related to

the animal type which is, in turn, related to the degree of intensity in the production methods.

Broiler¹ production in Germany is one of the most intensive animal production systems. It has the biggest number of animals reared and slaughtered every year. About 682 million broilers were slaughtered in the year 2009, which presents around 80% of the total number of all farm animals produced and slaughtered in the same year (FAOSTAT 2009). This huge production is due to the short reproductive cycle, the fast growing rates, and the genetic selection of broilers. The majority of broilers are produced traditionally by using very similar, large, and specialized system (conventional production), where birds are confined for their lifetime with a breeding density of about 38 kg per square meter. Broilers reach the slaughter weight of 2 kg at an age of about 40 days, which has been halved in the last 30 years (CIWF Trust 2003). Many critical practices were addressed as welfare problems associated with broiler production such as selective breeding to grow rapidly, high stocking density, and intensive feeding programs (SCAHAW 2000).

Due to the high intensification levels of broilers in the conventional production, there is a need for ensuring an appreciable welfare status of the broilers in this system. The responsibility to ensure and improve FAW in order to have a sustainable animal production is to be carried by different parts; mainly, consumers and policy makers. From the consumers' side, consumers are free to choose the livestock product quality they want and to pay its costs. The product quality reflects the FAW levels applied in the production methods. For policy maker, FAW can be achieved through legislations preventing the critical treatments against farm animals, developing new incentives to adopt friendlier production techniques, and finding out the suitable frameworks to clearly identify and label FAW in markets to enable consumers to make informed purchasing decisions which may give an incentive to the industry to adopt higher FAW standards.

In spite of the expressed interest of Western countries in FAW (Bennett and Blaney 2003, Carlsson et al. 2007, Christensen et al. 2006, Schröder and McEachern 2004) and the increasing amount of legislations related to it (EU 1999, EU 2001, EU

¹ A broiler is a type of chicken raised specifically for meat production.

2007a)², the market share of certified FAW products is relatively small in most of the EU countries (EU 2009). In Germany, there are very few programs for alternative broiler production reflecting special concern on FAW (see e.g., Verbraucherzentralen 2005).³ The market share of broiler products from such programs is too small and most broilers available in Germany are produced under the conventional system.

Taking FAW considerations into account in the free market will surely afford higher costs and the main responsibility is therefore on consumers to convert the desire to have animal-friendly production methods into an effective demand for their products (Webster 2001). In this context, the study focused on estimating consumer preferences for FAW using the stated preference approach, which is a suitable economic tool to provide information on the demand forecasting for possible policy changes or new products. Specifically, the study applied two popular stated preference techniques; the contingent valuation method (CVM) and the choice experiment (CE). These methods depend on creating hypothetical alternatives of the under-study good or service and asking respondents through surveys to express their preferences for them. Respondents are typically asked to express directly or indirectly their maximum willingness-to-pay (WTP) for the proposed hypothetical change, or their minimum willingness-to-accept (WTA) compensation for that change (Hanemann 1991). The earlier stated preference surveys had mostly used the CVM in environmental and agricultural economics.⁴ Recently, there has been a growing interest in the use of the CE to evaluate natural and economic resources.

FAW is one of the very recent food quality characteristics affecting consumer preferences and emerging as an area of potential added values. Therefore, it is expected that FAW will probably have a growing importance in the future which may also influence the world trade of livestock products. Currently, the EU is intensively studying the issue of FAW and trying to transfer interest in FAW into practice through the use of specific welfare claims on products and the inclusion of welfare conditions within supply

² Regulations concerning FAW can be reviewed on the gateway to the European Union in: http://ec.europa.eu/food/animal/welfare/farm/labelling_en.htm

³ The *Verbraucherzentralen* report mentions two alternative programs related specifically to FAW. The first one is the extensive program (Kikok); the second is the animal welfare raising program (Neuland).

⁴ While environmental economics usually emphasizes on preferences for public good attributes, agricultural economics emphasizes on preferences for private good attributes that do not exist in the market (Carlsson et al. 2004).

chain assurance schemes (Roe and Buller 2008). However, integrating FAW aspects into the production and market place implies many difficulties. Particularly, difficulties arise when placing a specific value on FAW, exploring its most critical attributes, eliciting to what degree consumers are ready to pay for it, and finding out the suitable market mechanisms and legislations in which FAW may be put into practice. This thesis deals with these challenges and contributes to the literature on the economic valuation of FAW from consumer perspectives.

2. Research objectives

Since quantitative analysis of an ethical consideration in food production is increasingly demanded to make a future prediction on the development of both consumption and production choices, the study aimed at estimating consumer preferences and the value they place on FAW with a particular focus on the case of broilers in Germany. The empirical investigations were applied by valuing consumer attitudes towards: (a) a certification label of FAW, (b) FAW attributes, and (c) alternative production systems. The main objectives of the study are thus:

- Estimating consumer WTP for a certified FAW broiler meat. The certification label “FAW-certified” ensures that the product has been produced with high respect to the welfare needs of the animals (chapter 2).
- Estimating consumer preferences for some FAW attributes needed for friendlier broiler production such as the possibility of having an outdoor access, slow growth rates, low stocking densities, and short transport periods (chapter 3).
- Estimating consumer WTP for alternatively produced broilers, specifically from extensive and free-range production systems (chapter 4).

In addition, the study deals with some other sub-objectives:

- Identifying the socio-economic factors that may influence consumer decision to buy certified FAW products (chapter 2).

- Investigating consumer preference heterogeneity for choosing the different levels of the FAW attributes (chapter 3).
- Exploring the influence of the socio-economic characteristics on consumer choice for the alternatively produced broilers (chapter 4).

3. Farm animal welfare and relations with productivity

Understanding how FAW status has been changed during the development of livestock production and its relation with productivity is important to locate the current and the desired FAW standards in a society. Figure 1 shows a simple production frontier used to explain relationships between livestock productivity and perceived FAW (McInerney 2004).

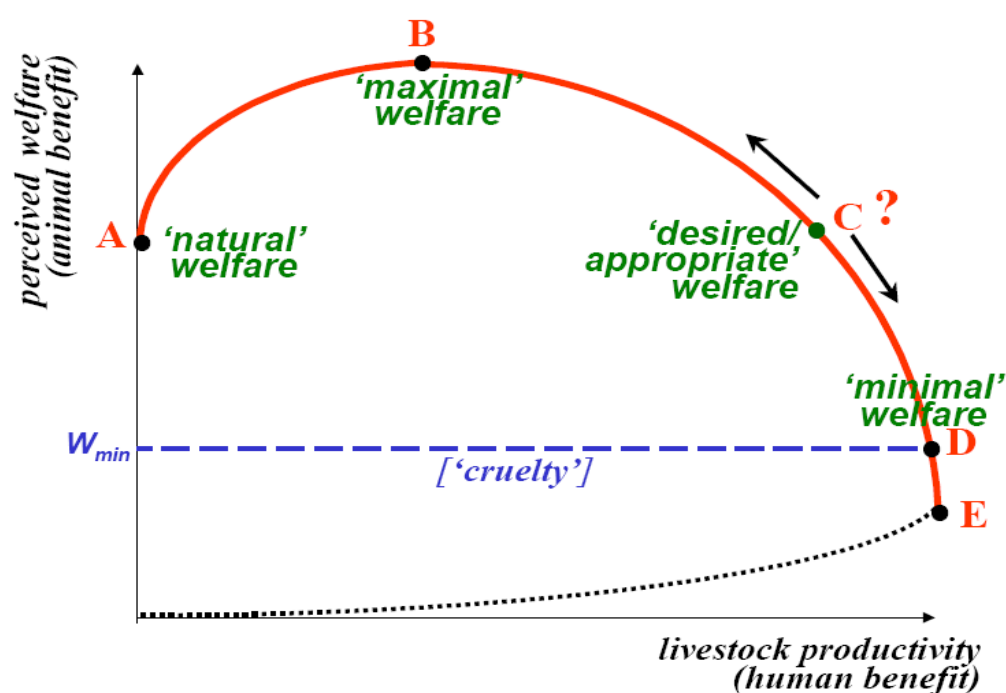


Figure 1: Conflict between perceived animal welfare and livestock productivity (McInerney 2004: 18)

A is the point when animals are domesticated in agricultural operations. After animals are domesticated, their welfare increases as inputs of shelter, feed, and protection; their productivity also increases at least until point B. Beyond this point, FAW decreases as a result of high intensification levels and the productivity increases till the point D.

Afterwards, poor welfare and inefficient use of the animals is expected due to over-intensive production. The area between B and D on the frontier is the situation where both livestock productivity and the associated FAW could be improved.

If FAW is a society interest, a point C between B and D could exist as the desired welfare position. This point reflects a willingness-to-accept less than the maximum feasible productivity from livestock. However, recognition that such a point exists have no implications on where it is exactly located. Its location will relate to the developing attitudes, awareness, and rising incomes of societies over time. Furthermore, different production methods are associated with different C locations. Intensive systems, for example, could be closer to point D, extensive systems further up the curve, and organic livestock production perhaps approaching B.

The policy challenge for considering FAW is to make judgment as to where point C lies for any given type of production or any supposed change in production practices and what mechanisms and policy interventions are needed or can be relied upon to deliver it. Therefore, economic valuation of FAW is important to reflect the society preferences and values.

4. European attitudes towards farm animal welfare - a review

The literature contains many studies describing the nature of consumer attitudes towards FAW within the EU. A report by Köhler (1999) on the nature of German consumer concerns about FAW pointed out that high FAW standards are expected to increase prices and consequently lessen consumers demand for animal products. Some personal disadvantages of high welfare standards were reported: high costs, less flexibility, and the need for more planning before shopping for often scarce animal-friendly products. Consumer concerns towards FAW in Belgium seemed to be less important when compared with human health concerns (Verbeke and Viaene 2000).

According to a survey of 2500 people in the UK, Ireland, France, Germany, and Italy, consumers defined FAW in terms of natural life and humane death (Harper and Henson 2001). Consumers' concerns about FAW were not only because of the impact on

animal well-being but also due to a perceived impact on food safety, quality, and hygiene. In addition, the study mentioned many barriers preventing high levels of interest in FAW from being translated into purchase decisions. These barriers are: (a) lack of information about production methods, (b) lack of availability of products, (c) lack of belief in personal influence to make a difference to FAW standards, (d) disassociating the product from the animal of origin, and (e) the increased cost of animal-friendly products. The study stressed that consumers preferred a combined strategic approach to address their concerns about FAW. This includes establishing a package of minimum standards and reforming agricultural policy from the supply side, compulsory labeling and consumer education from the demand side.

McEachern and Schröder (2002) found that Scottish consumers were only to a small extent concerned about FAW as criteria for fresh meat when compared with other attributes like price, taste, fat level, and country of origin. The study also showed that there was a consensus that FAW is a government issue. Meat produced with animal-friendly husbandry was perceived by Swiss consumers to be of a higher quality than that from animals reared intensively (Phan-Huy and Fawaz 2003).

The Dutch study of Te Velde et al. (2002) showed that farmers shifted the responsibility for FAW to consumers or retailers, indicating that they were ready to deliver high welfare if consumers paid for it or retailers demanded it. Consumers, in contrast, shifted the responsibility to the government and retailers without blaming farmers. Another Dutch study suggested that consumers think about FAW in terms of their health and living environment (Frewer et al. 2005). Most consumers believed that animal-friendly systems are a positive development; however, a negative impact on the demand of animal products may accompany the involvement of consumers in FAW issues.

The results of a survey carried out by the European Commission concerning consumer attitudes towards FAW indicated that there are very distinct perceptions with regard to the welfare and protection of farm animals within the Union (EU 2007b). This was explained by differences in the production systems as well as in consumer purchasing power. These differences were recognized between Northern and Southern countries and also between Western and Eastern countries. The study of Nocella et al. (2007) found that

consumer trust towards stakeholders' compliance with certification standards of animal-friendly products plays a major role in respondents' preferences. The study results also underscored that consumer preferences towards FAW across the EU seem to be affected by cross-cultural differences. Outcomes from two workshops held in England indicated that there was very little knowledge about broiler production methods (Hall and Sandilands 2007). Respondents related poor FAW conditions to the demand for cheap food.

From the above review, it is clear that attitudes towards FAW widely vary among consumers. The responsibility for FAW has been differently shown to be carried by consumers or put on governments.

5. Methodological framework

5.1 The stated preferences techniques

Economic valuation with stated preference techniques is common for estimating consumer benefits and the value they place on public goods and non-market attributes (Bateman et al. 2002, Bennett and Blamey 2001, Mitchell and Carson 1989). The methods rely upon the concept of utility and assume that consumers act rationally and always choose using utility maximizing criteria. These techniques use surveys to collect non-market data to be used in the analysis. Analysis of the data identifies some specific welfare measures⁵, which give a clear and meaningful interpretation of respondents' behavior relating to the supposed change in the studied products or services. Therefore, stated preference approach gains huge advantages when no market data is available, like estimating a new product or estimating a change in one or more characteristics of a product. The stated preference approach is introduced and developed as a market research tool to elicit consumer preferences.⁶ However, stated preference surveys are used not

⁵ The concept of welfare measures had been investigated for the first time by Hicks (1943), and was discussed later by Mitchell and Carson (1989), Hanley and Spash (1993), Marggaf and Streb (1997), and Bateman et al. (2002).

⁶ In addition to stated preference techniques as methods for analyzing consumer preferences, there is another group of methods called revealed preference techniques achieve the same purpose. Revealed preference methods need data from the past behavior of consumers (market data); stated preference, in contrast, need data collected through surveys about consumers' beliefs and intentions which may affect their future behavior (Louviere et al. 2000: 20).

only in marketing but also in travel behavior research, agricultural and environmental economics, health care, and food safety among others.

The critical points and disadvantages associated with stated preference techniques are mainly because of their hypothetical nature. Therefore, differences might be recognized between the alternatives that respondents state they will choose and the alternatives they really choose in real life situations. This can produce a potential bias in the magnitude of the welfare measures. Biases in non-market valuation have been discussed by Mitchell and Carson (1989), Hanley and Spash (1993), Bennett and Blamey (2001), and Bateman et al. (2002). Several hypotheses justify why biases might exist when applying these methods, some of them are explained in the following. First, the “embedding effect” which indicates that respondents might embed the issue of interest within a wider good due to moral satisfaction (Kahneman and Knetsch 1992). Willingness-to-pay in this case reflects the moral satisfaction of contributing to public goods, not the economic value of these goods. Second, the “warm glow hypothesis” which proposes that respondents are likely to make large donations in order to satisfy ethical and moral motivations (Diamond and Hausman 1993). Third, the “citizen value hypothesis” which means that respondents, guided by ethical concerns, tend to answer hypothetical trade-offs as citizens rather than according to personal self interest (Blamey et al. 1995, Sagoff 1988). Another source of bias may arise from modeling the trade-offs in the experiment (Bennett and Blamey 2001). Therefore, economic valuation using stated preference techniques is not without challenges and the stated preference surveys need to be carefully designed.

5.1.1 Classification of stated preference techniques

Many different methods are categorized under the classification of stated preference methods. Merino (2003) explained stated preference techniques and presented a classification of them (Figure 2).

The stated preference methods are divided in Figure 2 according to three dimensions. The first one is the *number of attributes*, which can be a combination of many attributes (multi-attribute) or a single attribute (mono-attribute). While contingent

valuation is the lonely example of mono-attribute valuation methods, both choice experiment and conjoint analysis are considered as multi-attribute methods. The second dimension is the *eliciting format*, which depends on the basis of preferences (e.g., the conjoint analysis) or choices (e.g., the choice modeling⁷). The third dimension is the *measurement scale*, which varies according to the way of investigation among rating scale, ranking scale, pair scale, and most preferred scale.

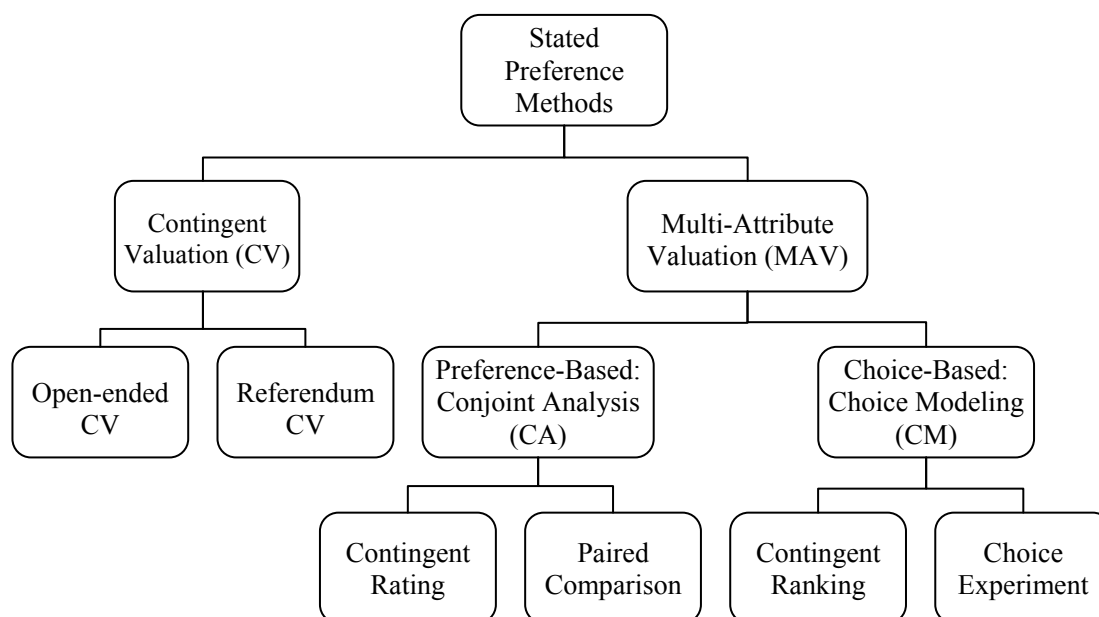


Figure 2: The family of stated preference methods (Merino 2003: 5)

According to these dimensions, significant differences could be recognized between contingent valuation on the one hand and both choice experiment and conjoint analysis on the other hand.

The study used both the contingent valuation and the choice experiment methods to measure the value consumers placed on broiler welfare. These two methods are shortly described in the next two sub-sections. The different applications of valuing FAW using these two methods are reviewed within the next three chapters.

⁷ The term choice modeling can be found in the literature under other names such as choice experiment, discrete choice, and stated preference discrete choice modeling.

5.1.2 The contingent valuation method

Cost-benefit analysis (CBA) provides the theoretical background within which CVM works. The CVM is originally proposed by Davis (1963) and basically used for non-market valuation (Hanley and Spash 1993: 53). It uses surveys in which individuals are asked directly to express their WTP/WTA for the hypothetical change being analyzed. Mitchell and Carson (1989: 3) divided the contents of a contingent valuation survey into three parts:

1. A detailed description of the good(s) being valued and the hypothetical circumstances under which it is made available to the respondent.
2. Questions which elicit respondents' willingness to pay for the good(s) being valued.
3. Questions about respondents' characteristics (e.g., age, income, education), their preferences relevant to the good(s) being valued, and their use of the good(s).

Since the elicited values in this approach are contingent upon the particular hypothetical market of the good described to the respondents, it is called the contingent valuation (Carson et al. 2003).

5.1.3 The choice experiment method

The Random Utility Theory (RUT) provides the conceptual fundament of the CE based on the neoclassical model of preference. In addition, the Lancasterian consumer theory (Lancaster 1966) provides an important behavioral foundation for the CE, which proposes that utilities for goods can be decomposed into separable utilities for their characteristics or attributes.

In CE surveys, respondents are given a sequence of choice sets and asked to select the most preferred alternative in each. A choice set contains a number of alternatives; one of them is the base option (the status quo or "do nothing" option). Each alternative is described in terms of a number of attributes that are offered at different levels. The specification model of the CE is the conditional logit model (CLM), which estimates

using the maximum likelihood procedure. Adamowicz et al. (1998: 12-16) provide an overview on the steps needed to conduct an experimental choice study. These steps are:

1. Characterization of the decision problem.
2. Attribute level selection.
3. Experimental design development.
4. Questionnaire development.
5. Sample sizing and data collection.
6. Model estimation.
7. Decision support system development.

The CE enables the estimation of respondents' trade-offs among the designed alternatives. In addition, it allows researchers to evaluate relationships between attribute levels and respondents' socio-economic characteristics. In the CE, respondents make choices not based on the marginal rate of substitution among goods but on preferences for attributes of these goods.

The first application of the CE in the environmental context was reported by Adamowicz et al. (1994). Since then, the CE has become popular for valuing various issues such as forest management (Boxall et al. 1996), health (Vick and Scott 1998), biodiversity (Cerdeira et al. 2006, Glenk et al. 2006), and food quality (Enneking 2004, Pouta et al. 2010, Profeta et al. 2008). A recent study of Hoyos (2010) reviews the CE in terms of design, econometrics, and analysis.

5.2 Demand, willingness-to-pay, and consumer's surplus

The demand model in the neoclassical consumer theory is studied under certain assumptions. First, the consumers, as an aggregate group, act rationally. Second, the consumer's goal is assumed to be utility maximization, which is restricted principally by both income and price (Hanley and Spash 1993: 26). The consumer problem is how to choose the best set among available goods under the restriction of price and income. The ordinary or Marshallian demand curve expresses the above problem as:

$$x_i = x_i(P, M)$$

That is, the quantity of x_i demanded is a function of a vector of prices P and money income M . Choosing the most preferred mix of the goods among available alternatives is supposed to maximize the utility derived from the consumption of the chosen mix of the goods. That is,

$$\text{maximize } U = U(X) \quad \text{subjected to } \sum p_i x_i = M$$

where U is the utility; X is the vector of quantities ($X = x_1, \dots, x_i, \dots, x_n$).

The consumer's best choice achieves the utility maximizing diagrammatically where the indifference curve is tangent to the budget constraint. This balance situation of utility maximization relates to the actual prices of goods in the markets. But, the price the consumers pay for a good in the market does not necessarily reflect the price they are ready to pay. This difference between what they are willing to pay and the actual price is called consumer's surplus (or Marshallian surplus). The relationship between WTP and consumer's surplus is explained on the demand curve as follows (Bateman et al. 2002: 22-23):

Figure 3 shows the demand curve for a product. The horizontal axis represents the quantity (units) of a product and the vertical axis represents the price per unit. Points on the demand curve indicate how much individuals are willing to pay for the last unit (marginal WTP) of the different amounts available in the market (example: they are willing to pay 10£ for the first 10 units and 8£ for the next 10 units). Total WTP in this case is the area under the demand curve. It is calculated for thirty units as: total WTP = $[(12 - 6) \times (30 \times 0.5) + (6 \times 30)] = 270\text{£}$.

If the market price settled at 6£, the total expenditure is then $30 \times 6 = 180\text{£}$. This indicates that the actual expenditure is less than the total WTP. In this case, the difference between total WTP and total expenditure ($270 - 180 = 90\text{£}$) is the consumer's surplus, which represents the shaded triangle in Figure 3. Consumer's surplus therefore measures the net change in utility (welfare). Total WTP is given by the equation:

$$\text{Total WTP} = \text{Market Price} + \text{Consumer's Surplus}$$

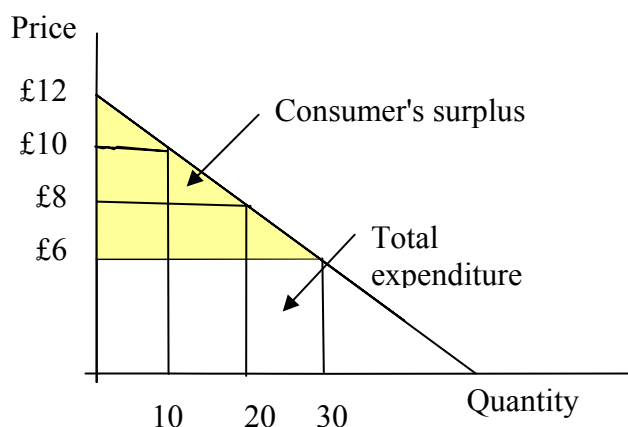


Figure 3: Demand and willingness-to-pay
(Bateman et al. 2002: 23)

The concept of consumers' surplus represents an important methodological fundament of the methods used in the current study.

6. Data collection

An exploratory survey was conducted in Göttingen for the purpose of collecting the current relevant data needed for applying the chosen stated preference methods. Göttingen is a city in lower Saxony, Germany. It has approximately 130,000 residents. Due to the diversity in the socio-demographic characteristics of its population, the city could best represent Germany as a whole. The survey was conducted using face-to-face interviews in supermarkets, public places (parks and city center), and at the university campus.

Before the main questionnaire was ready for the main survey, data was collected from semi-structured questions and a pilot survey. The semi-structured questions with 22 broiler meat consumers obtained information about consumers' understanding of broiler welfare. As a result, the main attributes used in the study were selected to reflect the most critical broiler welfare problems. After that, a complete version of the questionnaire was tested through a pilot survey of 73 broiler consumers. The pilot test indicated that only minor changes to the questionnaire were necessary in its final version. Later, a main survey of 300 consumers was carried out between July and September 2007. The study included only broiler consumers because the WTP questions were simulated to reflect a

purchase exercise at real market decision. The analyses were applied on the 300 completed questionnaires of the main survey.

7. Outline of the dissertation

The dissertation has the structure of a cumulative thesis. Following this introduction, the dissertation is organized in three chapters/manuscripts, each targets some of the research objectives mentioned previously. While chapter 2 reports results of the CVM, chapters 3 and 4 deal with the CE outcomes.

The second chapter “*Consumer Willingness-to-Pay for Farm Animal Welfare in Germany: The Case of Broilers*” includes literature review on estimating FAW using the CVM and the European legislation related to FAW. The main aim of the chapter is to estimate consumer WTP for a certified FAW broiler meat. The label “FAW-certified” ensures good welfare status of broilers on the farm and during transport and slaughter. Differences in consumer choices to pay for certified FAW broilers depending on the socio-economic characteristics are also investigated by applying regression analysis.

The third chapter “*Consumer Preferences for Different Farm Animal Welfare Attributes: A Focus on Broiler Production*” highlights the different applications of the CE to evaluate FAW and describes the conventional broiler production system and its welfare conditions. The chapter main objective is to address consumer preferences for different levels of FAW attributes; therefore, the most important welfare attributes needed for friendlier broiler production are explained in details. In addition, four latent class models are also estimated and discussed exclusively to address heterogeneity in consumer preferences.

The fourth chapter “*Consumer Willingness-to-Pay for Alternative Broiler Production Systems in Germany: A Choice Experiment Approach*” continues reporting results of the CE described in chapter 3. The main issue discussed is the alternative broiler production systems, which are reviewed and compared due to the different welfare conditions of the animals in each. Scenario analysis is the tool used to estimate consumer trade-offs among the different alternative broiler products. The focus is mainly on

extensive indoor and free-range products. Additionally, two utility models are estimated to show the effects of the socio-economic characteristics on consumers' choices for selecting the alternative products.

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Chapter 2

Consumer Willingness-to-Pay for Farm Animal Welfare in Germany: The Case of Broilers

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Abstract

The current study aimed at exploring consumer preferences and willingness-to-pay (WTP) for broiler meat in Germany which is certified as having been produced under a system that caters for farm animal welfare (FAW). In addition, logistic and linear regression models were estimated to examine the factors affecting consumers' decision to buy certified FAW products. The data was obtained from a survey of 300 German broiler consumers, which was designed using the contingent valuation methodology. The results showed that 82% of the respondents were ready to buy certified FAW products. A majority of these (95%) were willing to pay an extra sum of about €1.5 for 1 kg of the certified FAW broiler fillets. This represents a price increase of about 27% in comparison with the actual price of conventional broiler fillets. The WTP estimates indicate that there is a potential for improvement of FAW standards in conventional broiler production system in Germany. The magnitude of these estimates, however, shows that consumer WTP is below the actual price premium demanded by producers for existing animal-friendly programs for broiler production. This explains why the market for certified FAW broilers fails and calls for a policy change towards higher minimum standards of broiler welfare.

Keywords: farm animal welfare (FAW), broiler, contingent valuation method (CVM), willingness-to-pay (WTP).

1. Introduction

“Animal welfare is in reality a subset of human welfare”
(McInerney 2004)

The welfare of farm animals has become an important issue across developed countries (Bennett et al. 2002). This is shown by the increasing amount of legislations related to farm animal welfare (FAW) issues (Bennett and Blaney 2003, Harper and Henson 2001). Such legislations were first issued in the United Kingdom (UK) and have since been followed by legislations at the European Union (EU) level. The EU, for example, has issued a ban on conventional battery cages for laying hens starting from 2012. Similarly, a ban on sow stalls will come into force by 2013 (EU 1999, EU 2001).

In order to ensure FAW, minimum standards have been established by the EU. These minimum standards are supported by many mandatory and voluntary labeling schemes aimed at providing consumers with information on the welfare standards implemented in the production process. Labeling presents an effective tool to promote production systems that are in compliance with FAW standards (Passantino et al. 2008). Labeling schemes also provide an avenue for fulfilling certain requirements for quality assurance schemes like those aimed at ensuring issues such as food safety, product origin, and environmental protection.

Worldwide, many quality assurance schemes related to FAW are already established. For example: “Freedom Food” in the UK, “Label Rouge” in France, and “American Humane Certified”; “Certified Humane Raised and Handled”; and “Animal Welfare Approved” in the United States. Such labeling programs are largely voluntary third-party audit processes. The certification ensures that producers comply with special welfare standards that are higher than the minimum standards set up by the states. This provides consumers with an opportunity of buying products obtained with high FAW standards. The market share for such certified FAW products is relatively small in most of the EU countries (EU 2009a).

In spite of the existence of several programs for alternative animal production systems in Germany (Verbraucherzentralen 2005), only few programs for broilers emphasize FAW. In addition, the market share of broilers from the existing special FAW programs is too small and most broilers available for German consumers are produced under the conventional production system.

The welfare problems of broilers in the conventional production system are caused by many reasons such as selective breeding for rapid growth, high stocking density, intensive feeding programs, and long transit periods (Manning et al. 2007, SCAHAW 2000). These circumstances increase the probability of lameness, ascites, poor litter and air quality, high sudden death syndrome, and stress among others. Due to such conditions, European states identified broiler production to be among the three animal production systems most in need of improvements in terms of animal welfare and protection (EU 2005). Given this emphasis at the European level, this study focuses on the issue of broiler welfare in Germany. It analyzes consumer attitudes towards FAW by looking at the value they place on buying certified FAW broiler meat.

The value consumers placed on FAW has been largely estimated by applying the contingent valuation method (CVM), which is widely used for the valuation of environmental amenities and natural resources (Bateman and Willis 1999, Mitchell and Carson 1989). The method provides a tool for eliciting consumer willingness-to-pay (WTP) that is based on a hypothetical market for the good or service being analyzed. The hypothetical nature of the method, however, could produce a bias due to differences between responses in a hypothetical scenario and responses in real market situations.

The earliest applications of the CVM for valuing FAW were conducted to estimate WTP for policies supporting FAW (Bennett and Blaney 2002, Bennett and Larson 1996, Burgess et al. 2003, Moran and McVittie 2008, Rolfe 1999). The recent study provides an extension of existing literature by applying the CVM to estimate the expected extra WTP for a certified FAW broiler meat. The FAW certification ensures that the products have been produced under conditions that are compliant with the welfare needs of the animals. By evaluating WTP for FAW, the study aimed at investigating if there is any economic potential to improve broiler welfare in the conventional production system. In addition, regression analysis was estimated to examine the factors affecting

consumer decision to buy certified FAW products and the factors affecting consumer WTP.

The article is organized as follows: a review of animal welfare regulation in the EU is presented in section two. This is followed in the third section by a review of the studies using the CVM to evaluate FAW. The fourth section explains the analysis method including a brief introduction to the CVM, the survey design, and the data collection procedure. Section five contains results and discussion of the regression analysis and WTP estimates. Finally, conclusions from the findings and further research are presented in section six.

2. Animal welfare regulation in the European Union

Animal welfare regulation in the EU is based mainly on treaties and conventions adopted by the Council of Europe (Tomaselli 2003). The Amsterdam Treaty 1997, for example, included a special protocol on animal welfare, which introduced a clear legal obligation for the Community and member states to take full consideration of animal welfare requirements (EU 1997a).

When drafting animal welfare legislations, the EU policy makers work together with a number of independent advisory bodies that provide scientific support for the design and evaluation of animal welfare policies (Horgan 2006). Such bodies include the Scientific Committee on Animal Health and Welfare (SCAHAW), Scientific Veterinary Committee (SVC), and European Food Safety Authority (EFSA). The EU drafts minimum standards based on the lowest standards that can be supported by the member states. Members, however, remain free to adopt higher standards.

Animal welfare legislations on the protection of farm animals in the EU can be categorized in three groups under three basic conventions: (1) the European convention for the protection of animals kept for farming purposes (EU 1976), (2) the European convention for the protection of animals during international transport (EU 1968), and (3) the European convention for the protection of animals for slaughter (EU 1979). These conventions provide the framework for specific animal welfare regulations guiding the

handling of animals on the farm, during transport, and at slaughterhouses. Such regulations are: the Council Directive 97/2/EC, which prohibits the housing of calves in individual pens or boxes after the age of eight weeks for all holdings from January 2007 (EU 1997b). The Directive 1999/74/EC prohibits the introduction of newly built battery cages for laying hens for conventional non-enriched system from January 2003, and by January 2012, this system is to be completely prohibited (EU 1999). Directive 2001/88/EC bans, from January 2013, the use of sow stalls for all holdings from four weeks after service to one week before farrowing (EU 2001). Directive 2007/43/EC indicates that member states shall ensure that the maximum broiler stocking density in a holding or a house of a holding does not at any time exceed 33 kg/m². However, if specific criteria for the housing conditions are met, stocking density could be raised to 39 or 42 kg/m² (EU 2007).

In addition to such regulations, the EU was able to establish a mandatory labeling regulation for eggs. The labeling requires that the rearing methods used in egg production are clearly specified (EU 2003). The EU is currently exploring the possibility of establishing a system of animal welfare labeling for meat products in order to improve consumer information on welfare standards (EU 2009b). This is also aimed at harmonizing the market by eliminating widely differing welfare standards being used under the general “welfare” term.

Germany adopts the minimum standards set up by the EU and implements them in some cases even earlier than the European standards. For example, the ban on conventional battery cages became effective in Germany from 2007, while it will only become effective at the EU level from 2012. The Animal Welfare Act 1998⁸ is the primary piece of animal welfare legislation in Germany, which assigns responsibility to human beings to protect the well-being of animals and requires that no one may cause pain, suffering or harm to an animal without reason.

⁸ Animal Welfare Act is an English translation of the German (Tierschutzgesetz). The Act is available at: <http://www.animallaw.info/nonus/statutes/stdeawa1998.htm>.

3. Valuing farm animal welfare using the contingent valuation method - a review

The CVM has been used in several studies to evaluate FAW. Some studies have focused on public WTP for specific practices related to FAW. Some others have measured consumers' WTP for food products that are produced in compliance with high FAW standards.

The earliest applications focused on public WTP for specific practices related to FAW. Four examples of such studies are provided by Bennett and colleagues. The first study evaluated people's WTP for changes in the breeding conditions of two production systems, namely veal production using confined crates and egg production using battery cages (Bennett and Larson 1996). The estimated mean WTP in tax form for both veal and egg productions was around \$7.90. The second study assessed consumer WTP for better slaughter conditions. This implies a legislation compelling slaughterhouses to use the "Head to Back" system (Bennett and Blaney 2002). The reported mean WTP in tax form for the "Head to Back" slaughtering system was £1.37 p/week. The third study investigated WTP for a legislation to ban the export and import of live animals for slaughter and the use of egg cages (Bennett et al. 2002). The WTP estimates in this example were £1.60 p/week for export legislation and £0.94 p/week for egg legislation. The final study measured the willingness to support legislation to phase out the use of battery cages for egg production in the EU (Bennett and Blaney 2003). The study reported a mean WTP of £0.41 per dozen eggs for the EU egg legislation.

In yet another example, Burgess et al (2003) estimated public WTP for four specific improvements: removing the cages for the laying hens, using slower growing breeds for chicken, providing shared lying areas on a deep bed of straw for dairy cows, and increasing the size of pens and adding straw and rooting materials for pigs. The extra weekly WTP results showed that better laying conditions for hens was the most supported policy (£2.95) followed by better conditions for dairy cows (£2.89). Support for improvement in conditions for chicken (£2.63), and pigs (£2.10) followed in that order.

The general aim of these studies was to establish the moral concerns that people might have regarding specific welfare changes, which was supposed to be reflected in the WTP measures. Similar applications of the CVM can also be found in other studies (e.g., Glass et al. 2005, Moran and McVittie 2008, Rolfe 1999, Villalobos 2001).

In comparison to these studies, recent applications have concentrated on consumer WTP for food products produced with regard to high FAW settings. A German study analyzed consumer WTP for pork produced by a husbandry on straw with reduced breeding density (Schulze et al. 2007). About one third of the respondents were ready to pay up to €1 for 1 kg pork chop from the straw husbandry and 15% were ready to pay between €1.5 and €2. Another study compared consumer WTP for certified animal-friendly products including meat, eggs, and dairy products in five EU countries (Nocella et al. 2007). The stated WTP estimates were not for a specific change in animal treatment but for ensuring utmost respect for animals. WTP estimates showed that, on average, respondents were willing to pay an extra €11.11 p/week for animal-friendly products.

The present study contributes to the literature of consumer WTP for FAW by focusing on the important issue of broiler welfare, since little empirical evidence has been obtained in this area both in Germany and at the EU level.

4. Methods and data collection

4.1 The contingent valuation method

Contingent valuation is a stated preference method used for the valuation of non-market goods and services (Carson et al. 2001). It is a survey-based method in which respondents are asked to express their preferences towards a presented hypothetical market. The method combines neoclassical economic theory and socio-empirical methods to estimate the economic value of goods, services or public programs. Cost-benefit analysis (CBA) provides the theoretical background within which the CVM works.

By eliciting individuals' preferences, the CVM can find out whether they would be willing to pay (benefits) or to accept compensation (cost) for specific changes in the

quality or quantity of a given good. The analysis provides a mean to estimate the consumer surplus (compensating and equivalent variation) and answers questions regarding respondents' future intentions. Since the elicited values in this approach are contingent upon the particular hypothetical market described to the respondents, the method is commonly called contingent valuation (Carson et al. 2003).

4.2 Survey design

A four-section questionnaire following Mitchell and Carson (1989) was designed. The first section included some general introductory questions about consumption habits and knowledge of animal breeding systems. The second section solicited information about the conditions in which broilers are kept. A distinction was made between conditions of the conventional production system and other alternative systems with possible welfare improvements on living conditions, transport, and slaughter. These improvements were described to consumers as reducing stocking densities, decreasing growth rates, short transit periods, and rapid and effective stunning.

The third section presented attitudinal questions, in which consumers were asked to score on a likert scale of 1-5 (*1 = disagree, 5 = completely agree*) their opinions on: trusting the labeling information about FAW that could be found on the product; the need for the intensive production system, so that the price remains as low as possible; the meat quality from animal-friendly systems; and the degree of personal interest in buying meat from animal-friendly systems. Consumers were then asked if they would pay more for certified FAW products "FAW-certified" that ensure improved living conditions as well as proper transport and slaughter conditions. If the answer was affirmative, respondents were asked to state the price premium they would be willing to pay for 1 kg broiler breast fillets produced under the described conditions. A payment scale with seven consequential bids ranging from €0.75 to €5.25 was offered to elicit this price premium. An actual reference market price of about €5.50 for 1 kg conventional broiler fillets was presented to help consumers to make their choices. The payment scale technique was used because it enables respondents to select from a wide range of choices, which provides detailed information about consumers' response on the WTP question. The use of many bid amounts was to cover the various prices for broiler breast fillets in German

markets. The maximum bid amount of extra €5.25 represents an increase of 100% in the price of conventional meat. This is supposed to reflect the average extra cost of broilers from animal-friendly production systems such as the free-range broilers, which is twice as expensive to produce as conventional broilers (Theuvsen et al. 2005).

Following up on the WTP question, respondents who objected paying were asked to explain the reason behind their decision. Three possibilities for answering this question were presented. The first choice was *“in spite of my interest in FAW, I cannot afford high meat prices”*. The second was *“I am satisfied with the conventional system. How animal are farmed, is not a matter of interest to me”*. An open-ended choice was offered to be the third possibility for respondents to address their opinions.

The last section contained questions about respondents' socio-economic details such as sex, age, education, and income.

4.3 Pilot study and data collection

A pilot survey was conducted on 73 broiler meat consumers in Göttingen (Northern Germany). The questionnaire was clearly understood with the exception of the questions regarding animal breeding systems, which were not clear for a group of the respondents. For instance, respondents were unable to differentiate between animal-friendly and organic systems. To avoid such misunderstanding in the main study, differentiation was made later only between conventional and animal-friendly systems. Little knowledge about broiler production methods was also recognized in other studies in the EU (Hall and Sandilands 2007).

The main study consisted of a survey of 300 broiler consumers and was carried out in Göttingen between July and September 2007. This exploratory survey was conducted using face-to-face interviews in supermarkets, public places (parks and city center), and at the university.

5. Results and discussion

The analyses were applied on the 300 completed questionnaires of the main survey. It was undertaken using the Statistical Package for Social Sciences (SPSS version 16).

5.1 Descriptive statistics

The collected socio-economic data showed that about half of the respondents (49.7%) were women. The mean household size was 2.27 persons. Half of the respondents grew up in rural areas. Regarding respondents' education, 3.7% of the respondents had general school level, 21% had general certificate of secondary education, 44.3% had high-school diploma, while 31% had university degree. More descriptive statistics are provided in Table 1.

Respondents chose mostly the middle of the scale when asked about trust on labels regarding FAW, with 34% being somewhat trusting and 8.3% showing a high degree of trusting. Only 2.7% did not trust the labels at all. About 28% did not agree with the statement "*intensive farming is important, so that the price remains as low as possible*". In contrast, only 6.7% agreed with this statement completely. There was a strong feeling that FAW improves the meat quality. Sixty-five percent almost fully or completely agreed with this statement. Quite similar preference patterns were shown with respect to the degree of interest in buying meat from animal-friendly systems. About 59% almost fully or completely agreed that they are interested in buying meat from animal-friendly systems.

Table 1. Descriptive statistics for variables used in the study

	Minimum	Maximum	Mean	Percent of sample
<i>Socio-economic variables</i>				
Gender- female	0	1	-	49.7
Age*	1	7	3.36	
Household size**	1	5	2.27	
Origin- urban	0	1	-	50.0
Income***	1	7	3.29	
Education- General school	0	1	-	3.7
General certificate of secondary education	0	1	-	21.0
High school	0	1	-	44.3
University	0	1	-	31.0
<i>Attitudinal variables</i>				
Trust labeling	1	5	2.82	-
The need of intensive farming	1	5	2.44	-
FAW improves meat quality	1	5	3.82	-
Degree of interest in buying meat from animal-friendly systems	1	5	3.71	-

*Seven age groups were given (17-20, 21-30, 31-40, 41-50, 51-60, 61-70, and over 70 years) and coded from 1 to 7, respectively.

**A number from (1-5) persons in the household was offered for this variable.

***Seven monthly net income groups in Euros were given (up to 499, 500-999, 1000-1499, 1500-1999, 2000-2499, 2500-2999, and above 3000) and coded from 1 to 7, respectively.

5.2 Regression analysis

Regression analysis was carried out in order to show the effects of socio-economic characteristics on consumers' purchase decisions. Two regression models were estimated, namely: a binominal logit model to identify factors determining whether or not a consumer is willing to pay for FAW, and a linear regression model for the sub-sample of respondents reporting positive WTP. The independent variables used in the study included (a) dummy variables: gender (0 = male, 1 = female), origin (0 = grew up in rural areas, 1 = grew up in urban areas), and education level (1 = university, 0 = otherwise);

and (b) continuous and interval variables: household size (1-5), age (seven age groups were given 17-20, 21-30, 31-40, 41-50, 51-60, 61-70, and over 70 years. The age groups were coded from 1 to 7, respectively), income (seven monthly net income groups were given €499, €500-999, €1000-1499, €1500-1999, €2000-2499, €2500-2999, and above €3000. The income groups were similarly coded from 1 to 7, respectively).

a. The binominal logit model

This model was used to determine the factors affecting consumer willingness /unwillingness to pay for “FAW-certified” products. The respondents who rejected paying extra were coded 0 and all others who accepted to pay more were coded 1. Results derived from the binominal logit model are presented in Table 2. The coefficient estimates refer to the effect of the variables on the probability of accepting to pay more for “FAW-certified” products. Since the adjusted R square should not be used in the binary logistic regression, other alternatives such as Cox & Snell R square and Nagelkerke R square could be calculated. Their corresponding values revealed that more than 40% of the variation could be explained by the variables included in the estimated model. Gender and origin were not significant and therefore did not affect the decision on whether or not to pay more for “FAW-certified” products. Elderly people, respondents with high incomes, and those with large families were found to be more likely to accept paying more for certified products. University education level was significant at 1% level indicating a positive significant effect of higher education on consumer decision to support FAW.

b. The linear regression model

For further analysis, a linear regression model was used to examine the relationships between socio-economic characteristics and positive WTP estimates. Table 2 presents results of the estimated linear regression model. In this model, all of the independent variables were significant except origin, which did not seem to affect consumer WTP for “FAW-certified” broiler meat. The estimated adjusted R square revealed a good fit of the model. The results of this model appeared to be similar to the above mentioned one with the exception of gender factor, which was not significant in the binominal logit model.

Table 2. Parameter estimates of the WTP regression models

Variable	Binominal logit Model		Linear Model	
	β	S.E.	β	S.E.
Gender- female	0.021	0.062	0.323***	0.090
Age	0.229***	0.022	0.284***	0.007
Household size	0.097***	0.025	0.315***	0.011
Origin- urban	-0.004	0.064	-0.022	0.026
Education- University	0.204**	0.077	0.078**	0.030
Income	0.212***	0.026	0.088***	0.009
Adjusted R square			0.874	
Cox & Snell R square	0.419			
Nagelkerke R square	0.558			

* Significant at 0.05 level, ** significant at 0.01 level, *** significant at 0.001 level

5.3 Willingness-to-pay estimates

Nearly 82.3% of the respondents were willing to pay extra for certified FAW products, while the rest (17.7%) objected paying more.⁹ Among those willing to pay more, the WTP was much stronger for three bids. The second bid (€1.5) was the most preferred one and was chosen by 30.2% of the respondents. The second most preferred bid was the third one (€2.25), which was chosen by 26.9% of the respondents. The fourth bid (€3) was chosen by 22% of the respondents and was the third most preferred bid. The two extreme edges of the payment scale were less preferred. The lowest bid (0.75) was chosen by 6.1% and the highest bid (€5.25) by only 1.6%. The frequency distribution of WTP amounts was found to be right-skewed (Figure 1).

⁹ The reason behind rejecting paying more in the pilot study was mostly (85%) because consumers could not afford high prices. About 11% showed no interest in animal treatment. Four percent mentioned other reasons like having other important issues or believing that they are not responsible for animal welfare. This question was not included in the main survey because consumers did not show high response to answer it.

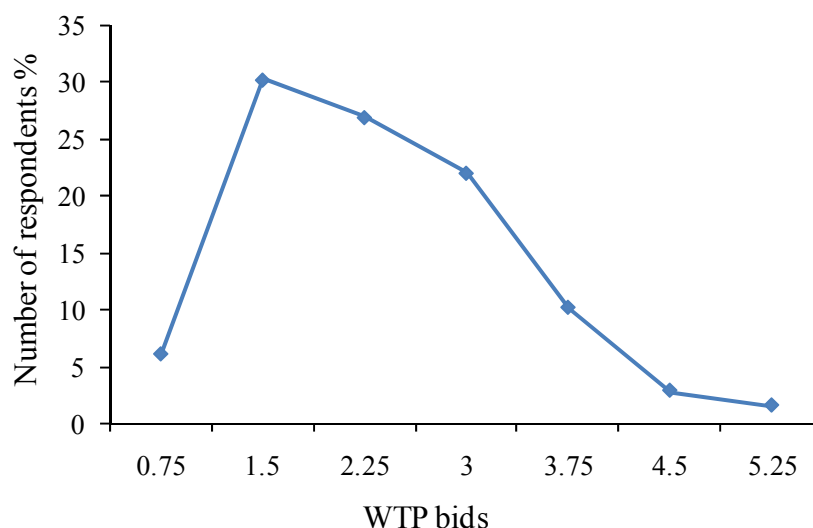


Figure 1. Frequency distribution of WTP for broiler welfare

The calculated mean WTP for 1 kg of “FAW-certified” broiler fillets was found to be €2.36 with a standard deviation of 0.95. These WTP estimates are in line with other studies addressing FAW issues. Schulze et al. (2007), for example, reported that the majority of German consumers were willing to pay a price premium of about 10-35% in support of a pig husbandry on straw with a reduced breeding density.

The estimated WTP amounts in this study present evidence of strong support for FAW among consumers, particularly with respect to the welfare of broilers. There is therefore a need for policy makers to develop legislations and production methods that are in tandem with consumers’ wishes and thus enforce higher FAW standards than currently observed in the conventional broiler production system. The estimated mean WTP is lower than the price premium on broiler meat produced under some existing special FAW programs such as the free-range system. The price of broiler meat from free-range husbandry is at on average double the price of conventionally produced broiler meat. Yet, in the present analysis, the doubling of broiler meat prices in support of FAW is shown to be supported by a very small share of the consumers. Only 1.6% were ready to pay the last bid (€5.25), which represents a price increase of 100% relative to the price of conventionally produced broiler meat. However, the mean WTP reported in this study shows that there is a potential for improving FAW. It represents up to 43% premium on the price of conventional broiler, which can cover the costs of improving some indoor conditions of the conventional production system. Improvements in indoor conditions can

be achieved by practices such as reducing stocking densities, slow growing rates, and adding some environmental enrichments.

6. Conclusion

In this study, we explored consumer attitudes towards and preferences for FAW. At the center of the analysis was the issue of consumers' WTP for "FAW-certified" broiler meat. Based on a consumer survey of 300 broiler consumers conducted in Germany in 2007, the study applied the CVM to estimate consumer marginal WTP for "FAW-certified" broiler meat.

Consumers showed little knowledge about animal-friendly production methods. In addition, there was a strong feeling among consumers that FAW improves meat quality. The results of the WTP analysis indicate that a "FAW-certified" broiler product is positively valued by German consumers. Around 82% of the respondents were ready to buy certified FAW products. A majority of these (95%) were willing to pay an extra sum of about €1.5 for 1 kg of the certified FAW broiler fillets. This represents a price increase of about 27% in comparison with the actual price of conventional broiler fillets. The mean WTP presents consumer surplus for improving the welfare of broilers. Nevertheless, the magnitude of this surplus showed that consumer WTP is lower than the price of the existing welfare-labeled broilers. The estimated two regression models showed almost similar results. In both the binominal and the linear regression models, elderly people, those with large families, and people with high incomes revealed to show significant WTP for "FAW-certified" broiler meat.

Based on the estimated WTP and the positive consumer impression of meat quality from animal-friendly products, the study suggests that there is a potential for improving the welfare conditions of broilers in Germany. The significant gap between the measured WTP and the high consumer prices of broilers from the existed animal-friendly production systems provides evidence that the free market mechanisms will probably not contribute effectively towards improving broiler welfare since the high price premiums were only supported by a small segment of consumers. Therefore, raising minimum

standards by implementing stricter FAW regulations seems to be a more effective way to improve the welfare of broilers.

The welfare improvement, however, could be achieved by many different practices such as reducing stocking densities, slow growing rates, and short transport periods. More accurate estimates of consumer WTP would thus require methods that evaluate consumer preferences for the individual practices, which in turn enable the identification of those practices presumed by consumers to be of critical welfare importance in the production process. Such analysis would require other stated preference methods such the choice experiment, an option we intend to apply in our further analyses.

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Chapter 3

Consumer Preferences for Different Farm Animal Welfare Attributes: A Focus on Broiler Production

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Abstract

A bundle of non-market food quality attributes has recently become important in food labeling strategies. Attributes reflecting issues such as farm animal welfare and food safety are increasingly being demanded due to consumer concerns about the way in which food is produced. This study used the choice experiment method to investigate how consumers value different animal welfare attributes focusing on broiler production in Germany. The choice experiment design included three attributes: (a) outdoor access possibility and age of birds at slaughter, (b) the stocking density, and (c) conditions during transport and slaughter. These attributes were studied at different levels reflecting different welfare standards by asking consumers to make trade-offs among a number of hypothetical production scenarios. The results of the estimated one-class multinomial logit model showed that all FAW attributes had a positive effect on consumers' choices with an increased probability of choosing an alternative product when giving broilers outdoor access with slower growth rate, decreasing stocking density, and improving conditions of transport and slaughter, respectively. Interestingly, the also employed latent class analysis showed that the stocking density attribute has a high relative importance for a large segment of consumers. The positive consumer preferences for welfare attributes suggest that policy changes towards higher welfare standards are strongly supported. This calls policy makers and chicken industry to diversify broiler production methods and shift to more welfare-friendly approaches.

Key words: consumer preferences, broiler, farm animal welfare (FAW), choice experiment (CE), latent class analysis.

1. Introduction

“Almost without exception, everything human beings undertake involves a choice”
(Hensher et al. 2005)

Recently, a trend in consumer food choice towards more demand for food quality attributes has been recognized in developed countries. Food quality attributes that relate to consumers' concerns about the way in which a food product is produced are called process attributes (Grunert 2006). These attributes are now reflected in many differentiation strategies like the labeling of organic, free-range, and GMO-free products. Process attributes that emphasize specifically on farm animal welfare (FAW) are increasingly affecting consumer preferences (Mitchell 2001, Tonsor et al. 2008).

Economic valuation of consumer preferences helps for supplying the product quality that consumers wish. Estimating consumer preferences for food quality attributes has been increasingly applied using the choice experiment (CE) methodology. The CE studies for valuing food quality attributes focus on different issues such as growth hormones (Alfnes 2004, Lusk et al. 2003), country of origin (Alfnes and Rickertsen 2003, Louriero and Umberger 2003, Pouta et al. 2010, Profeta et al. 2008), food safety (Christensen et al. 2006, Enneking 2004, Louriero and Umberger 2007), and genetically modified food (Carlsson et al. 2004, Lusk et al. 2003).

The CE approach is also applied to value FAW by investigating consumers' choice for some FAW attributes provided at different levels. In this context, a couple of empirical studies from Scandinavia presents useful examples for valuing FAW attributes. Carlsson et al. (2005) valued a large number of food quality attributes that are not available in the Swedish market. They found a positive effect of the ban of genetically modified fodder, slow growing rates, and outdoor access on Swedish consumers' choice for chicken. A Danish study found similar results for the chicken market and forecasted a large market potential for outdoor-produced chicken in case of informing consumers about the production method (Mørkbak and Nordström 2007). Another study on the Swedish pig production ascertained that Swedish consumers have positive valuation for

attributes such as outdoor access, the use of own farm feed, and castration with anesthesia (Liljenstolpe 2005). These results were confirmed by Lagerkvist et al. (2006), where Swedish consumers have been reported to have a high preference for allowing fattening pigs to have outdoor access and to strongly oppose fixation of sows. Complementary to these studies, Tonsor et al. (2008) detected a significant preference for pork from farms which voluntarily do not use gestation crates, whereas pork from large farms or from Brazil was found to reduce the choice probability of American consumers.

Some studies have included in the hypothetical scenario FAW attributes in addition to other market and non-market attributes such as brand name, country of origin, and food safety. A different relative importance of FAW has been derived from such studies. A German study explored that animal welfare attribute have the highest relative importance for German consumers when compared with brand and price attributes (Theuvsen et al. 2005). Pouta et al. (2010) found that Finnish consumers value animal welfare attribute of less importance than the country of origin attribute.

This study focused on German consumer preferences regarding attributes related only to FAW using the CE method. Broiler production was chosen due to its very intensive nature which may be associated with many welfare problems as discussed in the next section. Such a German case study might provide an opportunity to assess the reactions of consumers towards increased product differentiation, since the supply of broiler products has been very homogenous in terms of production methods. The study examined different FAW attributes with a main goal of identifying the most preferred welfare attributes and the respective attribute levels. The design of alternative broiler products in the hypothetical scenarios consisted of different levels of three FAW attributes: (a) outdoor access possibility and age of birds at slaughter, (b) the stocking density, and (c) conditions during transport and slaughter. Since consumers usually show heterogeneity in their preferences when studying the demand for food attributes (Hu et al. 2004, Lusk and Hudson 2004, Nilsson et al. 2006, Tonsor et al. 2008), the study applied latent class analysis to search for different consumer segments for choosing the FAW attributes. Such information about consumer attitudes towards FAW attributes could provide a new source of competitive advantage for firms and producers.

The article is organized as follows. Section 2 provides a description of the traditional broiler production and its associated animal welfare problems. The research method is presented in sections 3 and 4; with an explanation of the CE design (section 3) and the utility model (section 4). The fifth section summarizes the findings of the multinomial logit and latent class models. Conclusions and recommendations of the study are outlined in section 6.

2. The conventional broiler production system and its welfare implications

Broilers in the conventional system are intensively produced and kept indoors in closed mostly large-scale farms. Only two or three breeding companies supply around 90% of the world's breeding broilers (CIWF Trust 2003). Stocking density in this system is around 38 kg/m² but it reaches in some cases 42.5 kg/m² (about 25 birds/m²). Nowadays, broilers grow very fast and reach the slaughter weight (about 2 kg) in a short time of around 40 days, which is half the time the production cycle took 30 years ago (CIWF Trust 2003). This steep progress has been mainly obtained because of the genetic selection of strains and intensive feeding programmes.

Broilers are reared on litter, which is not changed during the production period. Ventilation, temperature, and humidity are mostly fully controlled. Lighting and feeding are applied according to the breeding recommendations, which vary according to the chicks' strain and the source company. Light intensity is kept low to reduce broiler activity, and consequently to maximize the body weight gain. Broiler feeding programmes involve a high protein diet giving the highest live weight in a short time. Access to water is unrestrictedly provided from nipple drinkers. These conditions vary slightly among farms and companies, but they reflect in general highly intensive rearing conditions with fast growth rates.

The conventional production system of broiler poses the thread of a couple of welfare problems. The Scientific Committee on Animal Health and Welfare (SCAHAW) has published a detailed report on the welfare of broilers in the traditional production

(SCAHAW 2000). The main addressed critical issues regarding broiler welfare in this report are discussed below.¹⁰

I. Selective breeding for rapid growth: Fast growth rates of broilers due to the successful genetic selection leads to many health problems such as lameness, ascites, and high sudden death syndrome. These affect the welfare of broilers dramatically because lame birds can not easily reach water or food; ascites and heart failures increase mortality rates significantly.

II. High stocking density: High stocking densities affect negatively the welfare of broilers by increasing stress, producing poor litter and air quality, and causing many behavioral restrictions such as scratching, walking, and pecking.

III. Low light intensities: Very low light intensities, which are continued overnight especially in the early ages, are provided to reduce movement on the one hand and to encourage broilers to eat more on the other. This affects the welfare of broilers because it may increase lameness and eye abnormalities.

IV. Intensive feeding programs: To maximize the economic benefits of breeding, specific nutrition programs that involve a high protein diet are developed to optimize performance and to ensure a high live weight in a short time. Slow growth feeding programs, in contrast, achieve less performance but improve the welfare of broilers by decreasing leg disorders, heart failures, and mortality rates.

In addition to these four issues, other welfare problems may appear during transport and slaughter. For example, a long distance transport with high densities causes increasing stress, deteriorating air quality, and increasing risk of diseases (Broom 2003), which harm the birds and enhance the number of animals that can not survive the transport. Regarding slaughter, different methods can be used for stunning including chemical and mechanical or electrical stunning (Mota-Rojas et al. 2008). The commonly used approach in commercial broiler production is electrical stunning, which is usually performed by hanging the birds upside-down by their legs and carrying them to an

¹⁰ Welfare indicators for broiler production are reviewed in other studies (e.g., Bessei 2006, Manning et al. 2007, Morris 2009).

electrically charged water bath. Thereafter, the birds are taken to automatic neck cutters. The welfare of the birds could deteriorate if they had to wait a long time before slaughtering in the slaughterhouse, crowded without food or water, and if they stayed conscious after stunning and then taken alive to the automatic neck cutters.

These issues affecting the welfare of broilers were taken into account when identifying the FAW attributes presented to the consumers in the CE survey.

3. The choice experiment

Attribute selection is the first step in designing the CE. A group of FAW attributes were selected after reviewing the welfare problems in broiler production. This was followed by semi-structured questions with 22 broiler meat consumers. The semi-structured questions offered information about consumer understanding of the selected welfare attributes. As a result, five attributes were chosen to be the most significant categories concerning the welfare of broilers. The five attributes (outdoor access, age, stocking density, transport, and slaughter) were combined in the CE survey in three main attributes having two or three levels each. Attributes and levels are presented in Table 1 and described in details below.

- *Outdoor access & age*: This attribute reflected two categories; the first of which, outdoor access, was explained by giving broilers the possibility to experience outdoor access starting at the age of 6 weeks. The second category, age, represented the age of birds at slaughter. It was given at three breeding ages: 40 days (fast growth), 60 days (medium growth), and 80 days (slow growth). With regard to these two components, three levels of the first attribute were created: *Indoor & 40*, *Indoor & 60*, and *Outdoor & 80*. These three levels were designed to reflect three production systems: conventional, extensive indoor, and free-range.

- *Density*: It is the stocking density referring to the number of birds per square meter. It was offered at three levels: 10 birds/m² (low density), 15 birds/m² (medium density), and 20 birds/m² (high density).

- *Transport & slaughter*: Two levels were explained for this attribute; with or without information about transport and slaughter. This information (label) ensured that the transportation and slaughter of broilers had been performed in compliance with some FAW recommendations (CIWF Trust 2003). These recommendations include: (a) the transport time (including loading, travelling, and unloading) should be about two hours without exceeding four hours, (b) densities during transport should be at extensive levels, (c) broilers should be given time to rest (recover) after transport and should not stay a long time to be slaughtered, and (d) effective stunning/killing of broilers by immediate loss of consciousness.

Table 1. Attributes and levels used in the choice experiment

Attribute	Levels	Definition
<i>Outdoor access & age</i>	<i>Indoor & 40</i>	Broilers kept indoors and slaughtered after 40 days
	<i>Indoor & 60</i>	Broilers kept indoors and slaughtered after 60 days
	<i>Outdoor & 80</i>	Possibility for broilers to have outdoor access with slaughter age of 80 days
<i>Density</i>	<i>High</i>	20 birds/m ²
	<i>Medium</i>	15 birds/m ²
	<i>Low</i>	10 birds/m ²
<i>Transport & slaughter (T&S)</i>	<i>No information</i>	No label indicates the welfare of the birds during transport and slaughter
	<i>With information</i>	With label ensures that transport and slaughter is in concord to the FAW recommendations
<i>Price (€/kg breast fillets)</i>		5, 7, 9, 11

In addition to these three process attributes, a monetary attribute reflecting the price of 1 kg of broiler breast fillets was added. Four different prices were used: €5, €7, €9, and €11. The highest price of €11 would reflect an increase of 100% of the conventional meat price, which is supposed to represent the average extra cost of broilers from animal-friendly production systems such as the free-range broilers, which is usually twice as expensive to produce as conventional broilers (Theuvsen et al. 2005). Including the price attribute to the experimental design facilitates the estimation of consumers' willingness-to-pay for FAW attributes in monetary terms (data not shown).

In a next step, product alternatives (profiles) out of the identified attribute levels were generated and combined to compose the choice sets. The number of all possible combinations of all attribute levels was $9 \times 2 \times 4 = 72$ profiles. Because this number is too large to be valued by the respondents, a reduced orthogonal combination of 16 profiles was derived using experimental design techniques (Adamowicz et al. 1999, Louviere et al. 2000). The 16 profiles were combined into choice scenarios with two product alternatives (*Product 1* and *Product 2*) and a no-choice option (*Neither product 1 nor 2*) which composed 16 choice sets. Table 2 shows an example of a choice set used in the questionnaire.

Table 2. Example of a choice set used in the questionnaire

Attribute	<i>Product 1</i>	<i>Product 2</i>	
<i>Outdoor access & age</i>	Indoor & 40 days	Indoor & 60 days	
<i>Density</i>	20 birds/m ² (high density)	10 birds/m ² (low density)	<i>Neither product 1 nor 2</i>
<i>Transport & slaughter</i>	No information	With information	
<i>Price</i>	5	9	
I choose (mark one alternative)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The inclusion of the no-choice option, as an opt-out alternative, was needed to simulate the purchase exercise at real market decisions, and thus to make the choice task more realistic (Carson et al. 1994, Vermeulen et al. 2007). The 16 profiles were blocked into two survey groups, each containing 8 choices, in order to reduce the number of the choice sets presented to each respondent, which is supposed to minimize respondent fatigue and increase the response rate (Carlsson and Martinsson 2006, Carson et al. 1994). The two groups were randomly assigned to the respondents, and each respondent was asked to make eight choice decisions.

The designed choice sets were introduced to the respondents within a general context, in which consumers were informed that this work aimed at valuing consumption habits of broiler meat. In addition, information including cons and pros of the presented

hypothetical scenarios were delivered to avoid overestimation. Giving broilers outdoor access, for example, was presented as an opportunity for broilers to express natural behavior on the one hand and as a source of risk of unexpected illnesses on the other hand.

The choice sets were presented to the respondents within a questionnaire consisting of three sections. The first section included some general introductory questions about broiler consumption habits, as a warm-up exercise for respondents before answering the CE task. The second section provided general context of some broiler production alternatives including information about the chosen attributes. The background information was followed up by presenting the choice sets. The last section contained questions about respondents' socio-economic details such as sex, age, education, and income.

A pilot survey of 73 broiler consumers¹¹ in Göttingen (Northern Germany) was carried out using face-to-face interviews. The CE sets were clearly understood. Results of the primary analysis of the pilot study showed that the experimental design worked well. Therefore, all attributes were included in the main study without modifications. A main survey of 300 broiler consumers was conducted in Göttingen between July and September 2007 using face-to-face interviews. This exploratory survey was carried out in supermarkets, public places (parks and city center), and at the university campus. The analyses were applied on the 300 completed questionnaires of the main survey.

The collected socio-economic data showed that about half of the respondents (49.7%) were women. The mean household size was 2.27 persons. Half of the respondents grew up in rural areas. Regarding respondents' education, 3.7% of the respondents had general school level, 21% had general certificate of secondary education, 44.3% had high school, while 31% had university degree.

¹¹ The first question in the survey was a filter question. Only respondents who do consume broiler meat were enrolled in the survey.

4. Model

The Random Utility Theory (RUT) provides the conceptual fundament of the CE based on the neoclassical model of preference. In addition, the Lancasterian consumer theory (Lancaster 1966) provides an important behavioral foundation for the CE, which proposes that utilities for goods can be decomposed into separable utilities for their characteristics or attributes (Adamowicz et al. 1998). In the CE, respondents make choices not based on the marginal rate of substitution among goods but on preferences for attributes of these goods.

According to the RUT, the utility function of a consumer i for choosing an alternative product k in a choice set C of N alternatives comprises an observable part V_{ik} and an unobservable error part ε_{ik} (Adamowicz et al. 1999).¹² Therefore, the utility function U_{ik} of this particular alternative k is given as follows:

$$U_{ik} = V_{ik} + \varepsilon_{ik} \quad (1)$$

V_{ik} is assumed to be linear and additive in parameters, which can be expressed as (Louviere et al. 2000: 49):

$$V_{ik} = \sum_{j=1}^J \beta_j X_{ikj} \quad (2)$$

where X_{ikj} is the value of a variable j (attribute) for an alternative k and a respondent i on a given choice set C ; and β_j is a parameter associated with the variable j (similar to regression coefficient).

The inclusion of the random part helps to make probabilistic statements about consumers' behavior. The selection of one alternative k over the other alternatives in a choice set C indicates that the utility of the chosen alternative is greater than the utility of the others. That is, the probability of a consumer i to choose the alternative k in a choice

¹² V_{ik} is called also deterministic or non-stochastic component; ε_{ik} is called also random or stochastic component.

set C is greater than any other alternative m in the same choice set C (Adamowicz et al. 1998). This can be expressed as:

$$P_{ik} = P[U_{ik} > U_{im}] = P[(V_{ik} + \varepsilon_{ik}) > (V_{im} + \varepsilon_{im})], \forall m \in C \quad (3)$$

The probability of a consumer i to choose an alternative k can also be written in the form of a conditional or multinomial logit model (McFadden 1974):

$$P_{ik} = \frac{e^{V_{ik}}}{\sum_m e^{V_m}} \quad \forall m \in C \quad (4)$$

In a latent class variant of the conditional model, it is assumed that individuals belong to different latent classes which differ with respect to the parameters appearing in the linear model for V_{ik} (Kamakura and Russell 1989). If the choice probabilities depend on class membership c , the logistic model will have the form:

$$\begin{aligned} P_{ik}(c_1) &= \frac{e^{V_{ike_1}}}{\sum_{j=1}^J e^{V_{jkc_1}}} \\ P_{ik}(c_2) &= \frac{e^{V_{ike_2}}}{\sum_{j=1}^J e^{V_{jkc_2}}} \\ &\dots \\ P_{ik}(c_n) &= \frac{e^{V_{ike_n}}}{\sum_{j=1}^J e^{V_{jkc_n}}} \end{aligned} \quad (5)$$

The only difference between latent class models and the aggregate model (shown in equation 2) is that the logit regression coefficients of the latent class models are allowed to be class specific. The determination of the number of segments c appropriate to

characterize a given population is not a part of the maximization procedure from which the parameter estimates are derived. The standard procedure of latent class analysis is to sequentially estimate model parameters for increasing values of segments c ($c = 2, 3, 4...$) until an additional segment does not improve the model fit. Model fitting can be measured by some statistical criterion like the log-likelihood, Pseudo-R², Bayesian Information Criterion or Akaike's Information Criterion (AIC) (Andrews and Currim 2003, Boxall and Adamowicz 2002).

5. Results and discussion

In the analyses, a dummy coding was used for the first three attributes (*Outdoor access & age*, *Density*, and *Slaughter & transport*). The cost attribute, *Price*, was coded by the actually used prices (5, 7, 9, and 11). In addition, an alternative specific constant (ASC) was also included in the multinomial logit model and coded as ASC = 1 for the alternative product and 0 for the no-choice option. The ASC was used as a predictor for choosing the alternative products relative to the no-choice option. The estimation of the one-class multinomial logit model was carried out by means of the software Limdep 3.0; whereas the software Latent Class Gold Choice was used for the latent class analysis.

The reported coefficients in Table 3 correspond to the different levels of the attributes. The results showed that the coefficients of all analyzed levels in the one-class multinomial logit model were highly statistically significant (p -values < 0.001). The cost parameter was, as theoretically expected, negative indicating that the higher the meat price, the lower the probability of choosing the alternative product. Regarding the *Outdoor access & age* attribute, the trend towards a higher FAW level was found to increase the probability of an alternative product to be chosen. Moreover, the probability of choosing broiler fillets increased when information on transport and slaughter were provided. Coefficients of the density attribute showed that the higher the density levels, the lower the probability of a product to be chosen. A Pseudo-R² of 0.2567 for the one-class multinomial logit model presents a good value of the model fitting (Costanzo et al. 1982, Urban 1993). The constant *ASC* was positive and significant at the 5% level showing that consumers tend to choose the designed alternatives over the no-choice option.

Table 3. Results of the one-class multinomial logit model

Variable	Coefficient	Standard error	t-ratio	p-value
<i>Indoor & 60</i>	1.2932	0.0959	13.487	<0.001
<i>Outdoor & 80</i>	2.1716	0.1128	19.224	<0.001
<i>Density 15</i>	1.3306	0.0973	13.682	<0.001
<i>Density 10</i>	1.5844	0.1005	15.760	<0.001
<i>With information about T&S</i>	0.7202	0.0737	9.775	<0.001
<i>Price</i>	-0.3122	0.0179	-17.467	<0.001
<i>ASC</i>	0.3468	0.1659	2.090	0.037
Log-likelihood	-1956.930			
No. of observations ^a	2400			
Pseudo-R ² (Constant only)	0.2403			

^a 300 respondents with 8 choice sets for each generates 300*8 = 2400 observations.

The four models of the latent class analysis presented in Table 4 showed more detailed results concerning consumers' behavior. Based on the AIC, a four-class-solution was chosen. The overall Pseudo-R² was improved to 0.4004. Pseudo-R² values for nearly all classes, except the second class, indicated good fit of the models. The first cluster had on average a higher preference for FAW attributes compared to the results of the total sample reported in Table 3. In this group, there were only very small and non-significant differences between the coefficients of the middle and the highest level of the first two FAW attributes (*Density* and *Outdoor access & age*). In contrast, in all other classes either only the middle FAW level was not significant or had a significant lower value compared to the highest level.

Regarding the second class, the coefficients of the highest level of the first two attributes appeared to be almost identical. The same held for class one. In contrast to the first two classes, classes three and four (one-third of the respondents) were found to have a higher preference for outdoor access and age than for a low density. Class three appeared to have the highest preference for the transport and slaughter label, while class four declined such a label.

The significances of *ASC* on 5% level for the first, third, and fourth classes suggest that there was almost always a preference to change from the no-choice option, which was also recognized for the one-class model. The high significance of *ASC* for class four reveals that a segment of the respondents chooses the alternative products mostly because they want an improvement in FAW which could be irrelevant to what specific change should happen.

Table 4. Results of the latent class models

Variable	Class 1 Coefficient	Class 2 Coefficient	Class 3 Coefficient	Class 4 Coefficient
<i>Indoor & 60</i>	2.9169*** ^a	0.2865	1.3225	0.2964
<i>Outdoor & 80</i>	3.0711***	1.0506***	3.8540***	4.1701***
<i>Density 15</i>	2.8175***	0.7278***	1.6665***	0.4216
<i>Density 10</i>	2.9576***	1.0354***	2.1453***	1.3467***
<i>T&S</i>	0.8647***	0.5163**	1.4128**	-0.6067*
<i>Price</i>	-0.2103***	-0.0830*	-0.0577	-0.3630***
<i>ASC</i>	0.9136*	0.6786	-1.8873**	6.1370***
Class Size	41.16 %	26.52 %	20.02 %	12.30 %
Pseudo-R ² ^b	0.4248	0.0778	0.3105	0.3491

^a Significance levels are: *** 0.001, ** 0.01, * 0.05.

^b The overall Pseudo-R² is equal to 0.4004.

The latent class models showed clearly that consumers are heterogeneous in their preferences. Therefore, the existence of a labeling scheme, which provides consumers with information on FAW attributes, will probably be accepted at least by a segment of consumers such as those of the first class. If policy makers intend to focus on a specific attribute, (e.g., *Outdoor access & age*), consumers belonging to the third and fourth classes could be the most preferable target groups.

6. Conclusion

In order to derive implications for policy makers and food companies regarding the possible change in production methods positively valued by consumers, the current study examined consumer preferences for specific broiler non-market meat quality attributes using the CE method. The chosen attributes reflected the most sensitive issues related to the welfare of broilers in conventional production. The results of the one-class multinomial logit model showed that all FAW attributes had a positive effect on consumers' choices with an increased probability of choosing an alternative product when giving broilers outdoor access with slower growth rate, decreasing stocking density, and improving conditions of transport and slaughter, respectively. The significant positive evaluation for the welfare attributes suggests that a policy change towards higher welfare standards is strongly supported by consumers and calls policy makers and chicken industry to diversify broiler production methods and shift to more welfare-friendly methods. Positive evaluation of FAW attributes has been also reported in other European studies (Carlsson et al. 2005, Lagerkvist et al. 2006, Liljenstolpe 2005). In these studies, the outdoor access attribute was found to have a strong impact on the buying decision which was also confirmed in our study.

The latent class analysis demonstrated that German consumers are heterogeneous in their preferences for broiler FAW attributes. Heterogeneity in consumer preferences has been also observed in other studies (Chalak et al. 2008, Hu et al. 2004, Pouta et al. 2010). The latent class models revealed that the two highest levels of *Density* and *Outdoor access & age* do affect equally the choice of a large segment of consumers which gives the *Density* attribute a high relative importance especially if we suggest that a policy ensures outdoor access will create probably higher costs in comparison of a policy of reducing stocking density.

Any policy change in production methods, however, could be better planned if consumer benefits were estimated in monetary terms and compared to its relative costs. Therefore, scenario analysis which enables the evaluation of possible welfare gains from the different alternative products is underway in our further analysis.

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Chapter 4

Consumer Willingness-to-Pay for Alternative Broiler Production Systems in Germany: A Choice Experiment Approach

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Abstract

The interest in how food is produced and how farm animals are kept has been recently recognized in most of the European countries. As a result, alternative animal production systems have been developed due to the public concern about issues like food safety, food quality, and animal welfare. Alternative products provide consumers with a choice of the used production methods. In Germany, alternative broiler production systems are less expanded in comparison to other meat production sectors and, thus, have only very small market shares. This study valued German consumer preferences and willingness-to-pay for different alternative broiler production systems including outdoor and extensive indoor systems using the choice experiment method. The results revealed that there is a potential for the growth of alternatively produced broilers in the German market since consumers showed high willingness-to-pay for animal-friendly oriented meat products.

Key words: alternative broiler production systems, choice experiment (CE), willingness-to-pay (WTP), scenario analysis.

1. Introduction

“Customer Satisfaction Management has become a strategic imperative for most firms”
(Anderson and Mittal 2000)

Due to the high intensification levels of factory farming during the last decades, common patterns of food consumption have changed towards a greater demand for quality attributes (Farina and de Almeida 2003). As a result, product differentiation strategies are being increasingly used in food markets which are based on product attributes and often reflected by product labels (Carlsson et al. 2005). Many food quality attributes have been used in the recent years to differentiate alternative products from conventional ones such as genetic modification, food safety, and farm animal welfare (FAW). Such diversification in production methods has been recognized in most European countries. Organic farming presents the most well-known example of an alternative production system, which has been spread worldwide (Willer et al. 2008).

Many alternative systems and labeling schemes are nationally developed to ensure high standards of FAW such as the “Label Rouge” in France and the “Freedom Food” in the United Kingdom (UK). Generally, alternative production systems are adopted in all major meat production sectors (Sørensen et al. 2006). Though, in the case of broiler production in Germany, they are less expanded and broiler products are very homogeneous in terms of production methods.

The European Union (EU) defined specific criteria for broiler production systems to be classified as alternatives (EU 1991). These alternatives include the extensive indoor (barn reared), free-range, traditional free-range, and free-range total freedom systems (explained in the next section). The EU definitions of these systems provide general categories according to which many common national production systems can be grouped. Alternative production systems in general are believed to guarantee high FAW standards.

Previous studies related to consumer preferences and willingness-to-pay (WTP) for alternative production systems have predominantly used the stated preference methods to address the relative importance of the different characteristics (attributes) of these production alternatives. Recently, the use of the choice experiment (CE) method has been expanded to value animal welfare attributes. A Swedish study by Carlsson et al. (2005) focused on a range of food quality attributes in pork, chicken, beef, egg, milk, and grain productions. The results indicated that consumers are willing to pay high premiums for slower growing chicken, outdoor production of pigs, and free-range barn systems in milk production. The mean WTP for 1 kg of meat from outdoor housing was estimated to be SEK 6.74 for broiler, SEK 1.82 for beef and SEK 27.5 for pork.¹³ Another Swedish study valued a large number of attributes related to FAW in pig production (Liljenstolpe 2005). These attributes included transportation, castration, housing systems, feed, mixing pigs, stocking density, and supply of straw. A marginal WTP of SEK 49.69/kg pork fillet was found for production with outdoor access possibility. Focusing also on pig production, a study of Lagerkvist et al. (2006) estimated WTP for four attributes related to potential FAW in Sweden. The valued attributes were: type of housing, castration, tail docking, and fixation. The study concluded that consumers place high value for allowing fattening pigs to be kept outdoors with a marginal WTP of SEK 47.9/kg, which presents an increase of about 64% relative to meat from indoor fattening in boxes. A recent study of Mørkbak and Nordström (2009) focused on FAW as an attribute of producing outdoor chicken in Denmark. A marginal WTP for the outdoor reared chicken in this study was found to be DDK 34.55 in case of informing consumers about the rearing methods.¹⁴ The study concluded that there is a welfare gain from the outdoor-reared chicken when consumers receive information about the production method used.

Since consumers in many Western countries showed interest in product differentiation strategies and the practices used in modern food production (Bennett and Blaney 2003, Mitchell 2001), this study aimed at exploring German consumer preferences and trade-offs among different alternative broiler production systems. Broiler production in Germany was chosen due to its high degree of intensification and the small market shares of the alternatively produced broilers in Germany in comparison with other

¹³ SEK 10 ~ EUR 1.07

¹⁴ DKK 10 ~ EUR 1.34

types of animal production or with other European countries (EU 2005). In particular, the study analyzed consumers' WTP for alternative production systems that emphasize on FAW such as free-range and extensive indoor systems; and for improvements in the welfare conditions of the conventional production system like decreasing stocking densities and having short transport periods. The organic production system was excluded from this study since it relates not only to animal well-being but also to consumer health and food safety. In addition, the study investigated the effects of the socio-economic characteristics on consumers' choices for selecting the different FAW attributes. To achieve the study aims, the CE method was used to estimate consumer WTP for alternatively produced broiler products, which differed in three FAW attributes: (a) outdoor access possibility and age of birds at slaughter, (b) the stocking density, and (c) conditions during transport and slaughter. The WTP estimates provide evidence on consumer benefits from possible changes in production methods and can be used to obtain predictions of the market potential of broilers from alternative production systems. Such information is not only useful for policy makers but also for production companies to seek premiums for production methods which are highly valued by consumers.

The article is organized as follows. The subsequent section provides some background of a number of alternative broiler production systems. The methodology used in the analysis is introduced in section three; briefly addressing the CE, the attributes selection, the experimental design, and the data collection procedure. Section four presents the results and a discussion of the WTP estimates which is followed by conclusions and policy recommendations in section five.

2. Alternative broiler production systems

Different types of broiler production are called alternative systems. They can be classified into three main groups, which are: conventional (aka industrial or intensive), organic, and animal-friendly systems (including both extensive indoor and outdoor systems). The European Commission Regulation No 1538/91 introduced detailed rules on some alternative broiler products and their marketing standards concerning both husbandry conditions and quantity thresholds for stating certain criteria such as age at slaughter, length of the fattening period, and content of certain foodstuff ingredients (EU 1991). The

regulation outlines characteristics of the extensive indoor (barn reared), free-range, traditional free-range, and free-range total freedom systems. The extensive indoor system of broilers is defined to have a maximum stocking density of up to 12 birds/m² but not more than 25 kg live weight. The broilers in this system are slaughtered at 56 days or later. The free-range system is described in this regulation to have the following characteristics: a minimum age at slaughter of 56 days or older, a maximum stocking density for the indoor area of up to 13 birds/m² but not more than 27.5 kg/m², birds must have outdoor access for at least half of their lifetime, a maximum stocking density of 1 m² per chicken for outdoor area, and a 70% share of cereal in the feed. These characteristics are common but not specific for all kinds of free-range broiler production. Therefore, two other free-range more welfare-friendly systems are also specified. The first one is the traditional free-range system, which requires, in comparison with the free-range system, slightly lower stocking density of 12 birds/m² and more extensive outdoor access area of 2 m² per chicken. In addition, a greater minimum age at slaughter of at least 81 days is demanded; and each broiler house should not contain more than 4800 birds at any single production period. The second system is the free-range total freedom system, which has mainly the same characteristics of the traditional free-range system with the exception that the birds should have a continuous day-time access to open-air runs of unlimited area.

Moreover, many broiler alternative systems are developed nationally due to local agricultural policies. A famous example is the “Label Rouge” broilers in France, which represents about one-third of the total French broiler production (EU 2009). “Label Rouge” is a pasture-based production system developed in the 1960s against the trend toward industrialization in food production (Westgren 1999). This system is a free-range system with some stricter production conditions such as a maximum transport time to slaughter of two hours. Another alternative broiler program is the “Freedom Food” in the UK. The “Freedom Food” label is a farm assurance and food labeling scheme set up by the Royal Society for the Prevention of Cruelty to Animals (RSPCA) in 1994 to improve FAW (RSPCA 2009). “Freedom Food” standards allow broilers to be reared indoors for their entire lives, however, more space and environmental enrichments should be provided.

The above review clearly shows that there is a diversity in the growing conditions of broiler productions. These conditions reflect different standards in terms of protection and welfare.

3. The choice experiment

3.1 Introduction to the method

The CE method is a stated preference technique used to elicit respondents' preferences by conducting surveys. The Random Utility Theory (RUT) provides the conceptual fundament of the CE based on the neoclassical model of preference. In CE surveys, respondents are given a sequence of choice sets and asked to select the most preferred alternative in each. A choice set contains a number of alternatives; one of them is the base option (the status quo or "do nothing" option). Each alternative is described in terms of a number of attributes that are offered at different levels. The CE enables the estimation of respondents' trade-offs among the designed alternatives. In addition, it allows researchers to evaluate relationships between attribute levels and respondents' socio-economic characteristics.

According to the RUT, the utility function of a consumer i for choosing an alternative product k in a choice set C of N alternatives comprises an observable part V_{ik} and an unobservable error part ε_{ik} (Adamowicz et al. 1999).¹⁵ Therefore, the utility function U_{ik} of this particular alternative k is given as follows:

$$U_{ik} = V_{ik} + \varepsilon_{ik} \quad (1)$$

V_{ik} is assumed to be linear and additive in parameters, which can be expressed as (Louviere et al. 2000: 49):

$$V_{ik} = \sum_{j=1}^j \beta_j X_{ikj} \quad (2)$$

¹⁵ V_{ik} is called also deterministic or non-stochastic component; ε_{ik} is called also random or stochastic component.

where X_{ikj} is the value of a variable j (attribute) for an alternative k and a respondent i on a given choice set C ; and β_j is a parameter associated with the variable j (similar to regression coefficient).

The inclusion of the random part helps to make probabilistic statements about consumers' behavior. The selection of one alternative k over the other alternatives in a choice set C indicates that the utility of the chosen alternative is greater than the utility of the others. That is, the probability of a consumer i to choose the alternative k in a choice set C is greater than any other alternative m in the same choice set C (Adamowicz et al. 1998). This can be expressed as:

$$P_{ik} = P[U_{ik} > U_{im}] = P[(V_{ik} + \varepsilon_{ik}) > (V_{im} + \varepsilon_{im})], \forall m \in C \quad (3)$$

The probability of a consumer i to choose an alternative k can also be written in the form of a conditional or multinomial logit model (McFadden 1974):

$$P_{ik} = \frac{e^{V_{ik}}}{\sum_m e^{V_m}} \quad \forall m \in C \quad (4)$$

3.2 The choice experiment design

The selection of the relevant attributes is the first step in designing the choice experiment. This is followed by developing the choice sets and finding the appropriate context in which the hypothetical scenarios will be presented to consumers.

3.2.1 Attributes selection

The attributes considered in the study were selected after reviewing the welfare problems in the conventional broiler production and the existing alternative production systems. Three attributes, having two or three levels each, were chosen (Table 1).

The first attribute, *Outdoor access & age*, reflected two categories; the first of which, outdoor access, was explained by giving broilers the possibility to experience outdoor access starting at the age of 6 weeks. The second category, age, represented the age of birds at slaughter. It was given at three breeding ages: 40 days (fast growth), 60 days (medium growth), and 80 days (slow growth). With regard to these two components, three levels of the first attribute were created: *Indoor & 40*, *Indoor & 60*, and *Outdoor & 80*. These three levels were designed to reflect three production systems: conventional, extensive indoor, and free-range.

The second attribute, *Density*, referred to the number of birds per square meter. It was offered at three levels: 10 birds/m² (low density), 15 birds/m² (medium density), and 20 birds/m² (high density).

The third attribute, *Transport & slaughter*, was offered at two levels; with or without information about transport and slaughter. This information (label) ensured that the transportation and slaughter of broilers had been performed in compliance with some FAW recommendations (CIWF Trust 2003). These recommendations include: (a) the transport time (including loading, travelling, and unloading) should be about two hours without exceeding four hours, (b) densities during transport should be at extensive levels, (c) broilers should be given time to rest (recover) after transport and should not stay a long time to be slaughtered, and (d) effective stunning/killing of the broilers by immediate loss of consciousness.

In addition to these three process attributes, a monetary attribute reflecting the price of 1 kg of broiler breast fillets was added. Four different prices were used: €5, €7, €9, and €11. The highest price of €11 would reflect an increase of 100% of the conventional meat price, which is supposed to represent the average extra cost of broilers from alternative production methods such as the free-range, which is usually twice as expensive to produce as conventional broilers (Theuvsen et al. 2005). Including the price attribute to the experimental design facilitates the estimation of consumers' WTP for the hypothetical alternative products in monetary terms.

Table 1. Attributes and levels used in the choice experiment

Attribute	Levels	Definition
Outdoor access & age	<i>Indoor & 40</i>	Broilers kept indoors and slaughtered after 40 days
	<i>Indoor & 60</i>	Broilers kept indoors and slaughtered after 60 days
	<i>Outdoor & 80</i>	Possibility for broilers to have outdoor access with slaughter age of 80 days
Density	<i>High</i>	20 birds/m ²
	<i>Medium</i>	15 birds/m ²
	<i>Low</i>	10 birds/m ²
Transport & slaughter (T&S)	<i>No information</i>	No label indicates the welfare of the birds during transport and slaughter
	<i>With information</i>	With label ensures that transport and slaughter is in concord to the FAW recommendations
Price (€/kg breast fillets)		5, 7, 9, 11

3.2.2 Experimental design

In this step, product alternatives (profiles) out of the identified attribute levels were generated and combined to compose the choice sets. The number of all possible combinations of all attribute levels was $9 \times 2 \times 4 = 72$ profiles. Because this number is too large to be valued by the respondents, a reduced orthogonal combination of 16 profiles was derived using experimental design techniques (Adamowicz et al. 1999, Louviere et al. 2000). The 16 profiles were combined into choice scenarios with two product alternatives (*Product 1* and *Product 2*) and a no-choice option (*Neither product 1 nor 2*) which composed 16 choice sets. Table 2 shows an example of a choice set used in the questionnaire.

The inclusion of the no-choice option, as an opt-out alternative, was needed to simulate the purchase exercise at real market decisions, and thus to make the choice task more realistic (Carson et al. 1994, Vermeulen et al. 2007). The 16 profiles were blocked into two survey groups, each contained 8 choices, in order to reduce the number of the choice sets presented to each respondent, which is supposed to minimize respondent fatigue and increase the response rate (Carlsson and Martinsson 2006, Carson et al. 1994). The two groups were randomly assigned to the respondents, and each respondent was asked to make eight choice decisions.

Table 2. Example of a choice set used in the questionnaire

Attribute	Product 1	Product 2	
Outdoor access & age	Indoor & 40 days	Indoor & 60 days	Neither product 1 nor 2
Density	20 birds/m ² (high density)	10 birds/m ² (low density)	
Transport & slaughter	No information	With information	
Price	5	9	
I choose (mark one alternative)	<input type="checkbox"/>	<input type="checkbox"/>	

The designed choice sets were introduced to the respondents within a general context, in which consumers were provided with information including cons and pros of the presented alternative products to avoid overestimation. Giving broilers outdoor access, for example, was presented as an opportunity for broilers to express natural behavior on the one hand and as a source of risk of unexpected illnesses on the other hand.

3.2.3 Questionnaire and data collection

The choice sets were presented to the respondents within a questionnaire consisting of three sections. The first section included some general introductory questions about broiler meat consumption habits as a warm-up exercise for respondents before answering the CE task. The second section provided general context of some broiler production alternatives including information about the chosen attributes. The background information was followed up by presenting the choice sets. The last section contained questions about respondents' socio-economic details such as sex, age, education, and income.

A pilot survey of 73 broiler meat consumers¹⁶ in Göttingen (Northern Germany) was carried out using face-to-face interviews. The choice sets were clearly understood. Results of the primary analysis of the pilot study showed that the experimental design

¹⁶ The first question in the survey was a filter question; only the participants who do consume broiler meat were enrolled in the survey.

worked well. Therefore, all attributes were included in the main study without modifications. A main survey of 300 broiler consumers was conducted in Göttingen between July and September 2007 using face-to-face interviews as well. This exploratory survey was carried out in supermarkets, public places (parks and city center), and at the university campus.

4. Results and discussion

4.1 Descriptive statistics

The analyses were applied on the 300 completed questionnaires of the main survey. About half of the respondents (49.7%) were women. The mean household size was 2.27 persons. Half of the respondents grew up in rural areas. Regarding respondents' education, 3.7% of the respondents had general school level, 21% had general certificate of secondary education, 44.3% had high school, while 31% had university degree. All studied socio-economic characteristics of the respondents are shown in Table 3.

Table 3. Socio-economic profile of the respondents

	Minimum	Maximum	Mean	Percent of sample
Gender- female	0	1	-	49.7
Age*	1	7	3.36	
Household size**	1	5	2.27	
Origin- urban	0	1	-	5.0
Income***	1	7	3.29	
Education- General school	0	1	-	3.7
Secondary education	0	1	-	21.0
High school	0	1	-	44.3
University	0	1	-	31.0

*Seven age groups were given (17-20, 21-30, 31-40, 41-50, 51-60, 61-70, and over 70 years) and coded from 1 to 7, respectively.

**A number from (1-5) persons in the household was offered for this variable.

***Seven monthly net income groups in Euros were given (up to 499, 500-999, 1000-1499, 1500-1999, 2000-2499, 2500-2999, and above 3000) and coded from 1 to 7, respectively.

4.2 The multinomial logit model results

For the CE analyses, a dummy coding was used for the three FAW attributes. The cost attribute was coded by the actually used prices (5, 7, 9, and 11). In addition, an alternative specific constant (ASC) was also included in the multinomial logit model and coded as ASC = 1 for the alternative product and 0 for the no-choice option. The ASC was used as a predictor for choosing the alternative products relative to the no-choice option. The model estimation was carried out by means of the software Limdep 3.0. Table 4 shows results of two multinomial logit models. The first, base model, included the main studied attributes. The second is the interacted model, which was estimated to investigate the effects of the socio-economic variables on consumers' choices for selecting the different attribute levels. Pseudo-R² values of 0.26 for the base model and 0.24 for the interacted model present good values of the model fitting (Costanzo et al. 1982, Urban 1993).

Table 4. The multinomial logit model results

Variable	Base model		Interacted model	
	Coefficient	p-value	Coefficient	p-value
<i>Indoor & 60</i>	1.2932	<0.001	1.2982	<0.001
<i>Outdoor & 80</i>	2.1716	<0.001	2.1816	<0.001
<i>Density 15</i>	1.3306	<0.001	1.5880	<0.001
<i>Density 10</i>	1.5844	<0.001	1.6751	<0.001
<i>With information about T&S</i>	0.7202	<0.001	0.7225	<0.001
<i>Price</i>	-0.3122	<0.001	-0.3142	<0.001
<i>ASC</i>	0.3468	0.0366	0.4648	0.0070
<i>Density 15*Income</i>			-0.1040	0.0040
<i>ASC*Origin_urban</i>			-0.2531	0.0062
Log-likelihood	-1956.930		-1949.025	
No. of observations ^a	2400		2400	
Pseudo-R ² (Constant only)	0.2567		0.2435	

^a 300 respondents with 8 choice sets each generate 300*8 = 2400 observations.

The results of the base model showed that the coefficients of all analyzed levels were highly statistically significant (p -values < 0.001). The cost parameter was, as theoretically expected, negative; indicating that the higher the meat price, the lower the probability of choosing the alternative product. The relative coefficient signs of all FAW attributes revealed that consumers preferred the higher welfare levels of the attributes in comparison with the reference levels. Regarding the *Outdoor access & age* attribute, the tendency towards a higher FAW level increased the probability of an alternative product to be chosen. Moreover, the probability of choosing broiler fillets increased when information on transport and slaughter was provided. Coefficients of the *Density* attribute showed that the higher the density levels, the lower the probability of a product to be chosen. The probability of choosing an alternative product increased when giving broilers outdoor access with slower growth rate, decreasing stocking density, and improving conditions of transport and slaughter, respectively. The constant *ASC* was positive and significant at the 5% level showing that consumers tend to choose the designed alternatives over the no-choice option.

In comparison with the base model, the interacted model did not give a strong evidence on the effect of the socio-economic variables on consumers' choices. From all possible interactions between attribute levels and the reported socio-economic variables (Table 4), only two interactions were found to be significant. The first (*Density 15*Income*) showed a negative effect of income on choosing the second density level. The second interaction (*ASC*Origin_urban*) indicated that consumers who grew up in rural areas were more likely to choose the alternative products.

4.3 Scenario analysis

As already mentioned, V_{ik} is the systematic (measurable) utility, which is a function of X_{kj} and an unknown parameter factor. In this study, X_{kj} represents the different levels of the FAW attributes, which are presented to a respondent i via an alternative product k according to the already mentioned experimental design. Now V_{ik} can be expressed as:

$$V_{ik} = ASC + \beta_1 * \text{Outdoor access \& age}_{ik} + \beta_2 * \text{Density}_{ik} + \beta_3 * \text{Transport \& slaughter}_{ik} + \beta_4 * \text{Price}_{ik} \quad (5)$$

where *Outdoor access & age* refers to three housing conditions (intensive indoors, extensive indoors, and outdoors). *Density* is a variable referring to the level of breeding intensity (20, 15, and 10 birds/m²). *Transport & slaughter* is the third determinant explained by giving or missing information which ensures good conditions during transport and slaughter. *Price* is the price level of 1 kg broiler fillets. *ASC* is an alternative specific constant used as a predictor for choosing the alternative products relative to the no-choice option.

The relative economic value of each alternative V represents the support that each alternative would gain. In the scenario analysis, some hypothetical alternative products were chosen. These alternatives could be divided into three groups. The first included two welfare improved conventional alternative products. The second one contained two alternatives representing the extensive indoor system. The third group consisted of two alternatives representing the free-range system. Table 5 shows the analyzed broiler alternative products.

Table 5. The analyzed broiler alternative products

Product	Attributes		
	Outdoor access & Age	Density	Transport & slaughter
<i>Improved conventional 1</i>	<i>Indoor & 40</i>	<i>15 birds/m²</i>	<i>No information</i>
<i>Improved conventional 2</i>	<i>Indoor & 40</i>	<i>15 birds/m²</i>	<i>With information</i>
<i>Extensive indoor 1</i>	<i>Indoor & 60</i>	<i>15 birds/m²</i>	<i>No information</i>
<i>Extensive indoor 2</i>	<i>Indoor & 60</i>	<i>10 birds/m²</i>	<i>With information</i>
<i>Free-range 1</i>	<i>Outdoor & 80</i>	<i>15 birds/m²</i>	<i>No information</i>
<i>Free-range 2</i>	<i>Outdoor & 80</i>	<i>10 birds/m²</i>	<i>With information</i>

If a base product is taken into account, the difference in utility (economic surplus) between the base product and any of the alternative products could be calculated using the following equation (Bennett and Adamovicz 2001):

$$\text{Economic surplus} = - (1/\beta_{\text{monetary}}) (V_1 - V_2) \quad (6)$$

where $\beta_{monetary}$ is the coefficient of the monetary (price) attribute; V_1 and V_2 are the indirect utilities associated with the base category and the “change” scenario, respectively.

By plugging in the coefficients of the base model (Table 4) into equation 6 for the explained alternative products (Table 5), economic surplus between these different alternatives and the baseline product were calculated (Table 6). The base product was chosen to reflect a conventional system (*Indoor & 40*) with the highest density of (*20 birds/m²*) and the non-labeled level of transport and slaughter (*No information*).

The economic surplus values reported in Table 6 showed clearly that German consumers support alternative broiler production systems and would pay significantly more money for them. Many consumer surveys in other EU countries reported also positive WTP amounts for alternative production systems, especially for outdoor and slow growth systems (Carlsson et al. 2005, Lagerkvist et al. 2006, Liljenstolpe 2005, Mørkbak and Nordström 2009).

Table 6. Economic surplus and end prices of the alternative broiler products

Product	Economic surplus (€/kg)	End prices (€/kg)
<i>Improved conventional 1</i>	4.26	9.76
<i>Improved conventional 2</i>	6.57	12.07
<i>Extensive indoor 1</i>	8.40	13.90
<i>Extensive indoor 2</i>	11.52	17.02
<i>Free-range 1</i>	11.22	16.72
<i>Free-range 2</i>	14.34	19.84

If the market price of conventional production set at €5.5, the estimated economic surplus could be also shown in form of end prices that consumers are willing to pay for the alternative products. End prices are also reported in Table 6 and calculated by adding the base product price to the economic surplus values.

The price of €9.76 for the *Improved conventional 1* could present a good opportunity for FAW improvement since such price exists in many German markets for

broiler meat from specific companies (e.g., Wiesenhof). The calculated prices of all other alternatives are almost equal or higher than the prices of free-range broiler meat. However, such WTP premiums could be biased in their strength because premiums of these sizes are unlikely to be actually paid by consumers. The high WTP values could be due to the fact that the price coefficients are often strongly underestimated in hypothetical choice experiments (Harrison and Rutström 2004, List and Gallet 2001). High WTP estimates have been reported in a number of experimental studies, especially when non-use values such as environmental and FAW attributes have been investigated (e.g., Louriero and Umberger 2007, Theuvsen et al. 2005, Tonsor et al. 2005). The WTP estimates, however, present indicators of consumer support for animal-friendly production methods.

5. Conclusion

This study evaluated consumers' preferences and willingness-to-pay for alternative broiler production systems. Broiler production was chosen due to its high degree of intensification and due to the small market shares of alternative broiler productions in the German market. The focus was only on attributes reflecting the welfare of the farm animals. The chosen alternative products were differentiated due to three welfare attributes. These included the possibility of having outdoor access and slow growth rates, the stocking density, and conditions during transport and slaughter. The study used the CE method to analyze consumer trade-offs among outdoor, extensive indoor, and conventional production systems.

The interacted utility model, which was estimated to investigate the effects of the socio-economic characteristics on consumers' choices, showed that consumers who grew up in rural areas were more likely to choose the alternative products. The economic surplus estimates showed that German consumers would pay significant extra amounts for extensively and free-range broilers. Interest in FAW and significant WTP for alternative products are also reported in other studies (Carlsson et al. 2005, Lagerkvist et al. 2006, Liljenstolpe 2005, Mørkbak and Nordström 2009, Pouta et al. 2010). However, this consumer interest is not reflected by the actual market shares of alternatively produced broilers in Germany, while the market of such alternatives has shown a stronger

expansion in many other EU countries. The French “Label Rouge” or the British “Freedom Food” broilers are examples of successful animal-friendly products; although, for example, the retailer price of “Label Rouge” broilers is double the price of conventional broilers (Westgren 1999). Therefore, other reasons could play an important role behind the slow development of such production methods in Germany.

These findings assure that there is a potential for the growth of alternative broiler products in the German market. A comparison of the market characteristics (i.e. production costs, competitiveness, and price dynamics) between Germany and other EU countries which show substantially higher market shares of alternative broiler products, could be helpful to identify strategies which enable to boost alternative production systems in Germany.

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Curriculum Vitae

I obtained the Syrian secondary education diploma in Habnimra, Homs, Syria in 1993. Then I studied Agriculture Science in Aleppo University, Syria for 5 years, and in 1998, I obtained the Bachelor degree in Agriculture Engineering. Thereafter (1999-2001), I worked as a lecturer at the Faculty of Agriculture, Al-Baath University, Syria.

In March 2000, I obtained the Diploma degree in Agricultural Economics from Aleppo University, Syria.

In May 2001, I was assigned as a postgraduate assistant at the Department of Agricultural Economics, Faculty of Agriculture, Damascus University, Syria.

In October 2004, I got a scholarship from the Syrian ministry of high education to perform a doctoral project in Germany.

In August 2007, I obtained the admission to the doctoral program at the Faculty for Agriculture, University of Göttingen.

Erklärungen

Hiermit erkläre ich, dass diese Arbeit weder in gleicher noch in ähnlicher Form bereits anderen Prüfungsbehörden vorgelegen hat.

Weiter erkläre ich, dass ich mich an keiner anderen Hochschule um einen Doktorgrad beworben habe.

Göttingen, den

.....

(Unterschrift)

Hiermit erkläre ich eidesstattlich, dass diese Dissertation selbständig und ohne unerlaubte Hilfe angefertigt wurde.

Göttingen, den

.....

(Unterschrift)