Implicit Prices of Sustainability Characteristics in Foods: the Case of the German Online Market for Honey

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Abstract:

Sustainability characteristics play an increasing role in food markets. At least some consumers are willing to pay a price for organic or regional production, animal welfare or fairtrade. In order to analyze implicit prices of sustainability characteristics, it is important to go beyond consumer studies as such characteristics do affect marginal costs as well. We employ a hedonic price analysis in order to compare price premia of very different sustainability characteristics on the German online market for honey. Honey is particularly interesting as it is perceived as a natural product and regional and organic production competes, e.g., with fairtrade products from developing countries. It is striking that consumer prices for honey contain positive as well as negative implicit prices for sustainability characteristics. Apparently, consumer valuation in terms of the marginal willingness to pay as well as marginal costs differ strongly across the sustainability characteristics.

Acknowledegment:

JEL Codes: Q13, C52

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1 Introduction

In many developed countries, consumers increasingly value eco-friendly and socially acceptable production while making purchase decisions. Consumer studies have revealed positive assessments for various sustainability characteristics in foods. It was shown that consumers have a positive marginal willingness to pay for characteristics such as ecological production (Cranfield, Deaton and Shellekeri, 2009), animal welfare (Lagerkvist and Hess, 2011), fairtrade (De Pelsmacker, Driesen and Rayp, 2005), local production (Adalja, 2015), the region of origin or protected geographical indications (van der Lans et al., 2001) as well as for combinations of sustainability criteria (Didier and Lucie, 2008).

Although some authors identified a 'consumer attitude-behavioral intention' gap for sustainable food consumption (Vermeir and Verbeke, 2006), the share of foods with sustainability characteristics has clearly risen. Taking Germany as an example, organic food sales increased by around 10% and added up to 8.62 billion Euros in 2015 (BMEL, 2016). Sales of fairtrade products grew by about 18%

between 2014 and 2015 and amounted, in 2015, to a total of 978 million Euros (Fairtrade International, 2016).

Sustainability characteristics of foods are often credence attributes. Consequently, consumers suffer from quality uncertainty. Asymmetric information along the lines of Akerlof's lemon problem (Akerlof, 1970) prevails on the markets for sustainable foods. Hence, consumers are not only interested in the sustainability characteristics of foods, but also in the labelling of those credence attributes (see Grunert et al., 2014, for a survey; Janssen and Hamm, 2012, and Loureiro and McCluskey, 2000, for the labelling of organic production and protected geographical indications respectively and Van Loo et al., 2014, for comparisons of sustainability labels).

There is an interest of manufacturers and retailers, too, to increase the supply of products which deliver sustainability attributes. The incentive is a price premium that can eventually be realized with those product characteristics. An increasing literature refers to the question whether price premia can be captured by producers, manufacturers or retailers by supplying sustainable foods.

In order to analyse impacts of sustainability characteristics on consumer prices, consumer-oriented willingness-to-pay studies are not sufficient. Hedonic price analyses are preferable since according to the basic approach of Rosen (1974), the supply of and demand for characteristics have to be taken into account. Sustainability characteristics will not only affect consumers' demand but also the marginal costs of supplying these characteristics. Hedonic price models have been applied to include sustainability characteristics such as animal welfare (Chang, Lusk and Norwood, 2010) or to general quality characteristics including regional origin (Combris, Lecoq and Visser, 1997). However, applications of hedonic price analysis to a larger variety of sustainability characteristics have been rare. This is the focus of our analysis.

It is the objective of our study to investigate how various sustainability characteristics affect the market price and, thereby, the marginal willingness to pay in an empirical case study for the German honey market. Honey seems to be particularly interesting, as its product characteristics include multiple sustainability criteria and thus allows a comparison of their implicit prices: Honey is a low-

processed food, which can be produced organically and offered in environmentally friendly packaging. Furthermore, it is one of the few products that may either originate in developing countries and qualify for fairtrade, or it can also be a domestic product of regional origin. Hence, it is possible to compare the implicit price for fairtrade with that of regional production. Such a comparison is not feasible for the most important fairtrade products (e.g. coffee, cocoa or bananas), as these commodities are solely cultivated in developing countries and not in industrialized countries.

The article is organized as follows. In Section 2, some background information on the German market for honey – including the online market – will be provided. In Section 3, it will be elaborated in a theoretical analysis that the addition of a sustainability characteristic to a food may or may not raise the market price depending on the implications of sustainability for preferences and marginal costs. In Section 4, the impacts of sustainability characteristics on German honey prices will be analysed with a data set of honey prices on the German online market. The data will be described, the empirical model outlined, and results will be presented and interpreted. We will summarize the results and derive some implications for future research in Section 5.

2 The German Market for Honey

Germany is a large net importer of honey with a self-sufficiency ratio of about 27% in 2016. Honey production, consumption and imports amounted to 21,600, 81,200 and 59,600 tonnes respectively (BLE, 2017). Foreign honey is usually imported in bulk, in steel drums with a volume of 200 litres (300 kilograms respectively). Due to high freight costs and quality concerns, pre-packaged honey is hardly imported (CBI, 2009: 25).

The domestic honey industry consists of approximately 40 small and medium-sized companies. Honey packers have their private labels under which they sell to retailers (CBI, 2009: 14-15). Blended honey from different geographic origins or different floral sources accounts for the major share (ibid.: 27). However, German apiculture remains a largely non-professional activity. About 95% of German beekeepers pursue beekeeping as a hobby (BMELV 2013: 4). In line with the

overwhelming number of small-scale hobby beekeepers, as much as 80% of domestic honey is sold directly to consumers (EC DG AGRI, 2013: 86-87). Both domestic beekeepers, as well as the domestic honey industry, may also offer German honey, labelled with the brand "Echter Deutscher Honig" of the Deutscher Imkerbund (D.I.B.). The D.I.B. is the (national) umbrella organisation of hobby and part-time beekeepers, consisting of approximately 92,000 members, i.e. 92 % of German beekeepers (Efken and Bernhardt, 2016). Honey carrying the D.I.B. label needs to fulfil higher quality criteria than required by German honey regulation (EC DG AGRI, 2013: 64).

German honey legislation regulates quality requirements as well as honey labelling. Indications of the honey's country of origin are mandatory. If the honey is blended from different countries, it may also be declared as "a mixture of honey from EU and Non-EU countries". Furthermore, it is allowed to voluntarily state the honey's regional, territorial or topographical origin (e.g. honey from Luneburg Heath). Organic honey production is regulated in the European Organic Regulation (EC) No. 834/2007 (Article 14) as well as in the Commission Regulation (EC) No. 889/2009 (Articles 13, 18, 19, 25). EU legislation constitutes minimum requirements for organic apiculture, while standards of the organic agricultural associations (e.g. Bioland, Demeter, Naturland) impose additional specifications on beekeeping and call for a higher product quality. For honey, organic quality is less a question of the bees' food source and more a question of how the apiarist may keep the honeybees and process the honey. For instance, chemical-synthetic veterinary medicine, which is most effective in treating the parasite varroa mite, is not allowed in organic production. Furthermore, organic honey cannot fully be harvested in summer. A reserve needs to be kept instead, in order to feed the bees with their own honey in colder periods. As a result, the German production volume of organic honey is limited (CBI, 2009: 11). Growth rates of fairtrade honey sales were high, however, fostered by an increased collaboration with own brands of retail companies (e.g. Aldi, Kaufland, REWE Group). In 2002, the globally uniform fairtrade label was introduced. In Germany, the label of the Fairtrade Labelling Organizations (FLO) is assigned by Trans-Fair e.V. Licensees are retailers, importers and producers. Monitoring and certification are executed by the independent FLO-Cert GmbH (FLO, 2017). Additionally, the GEPA label is important. GEPA is

the largest European fairtrade company, which was founded in 1975. GEPA imports, distributes and sometimes also processes products from Asia, Africa and Latin America. Its product range is monitored and certified by the established international monitoring and certification systems, such as FLO, World Free Trade Association (WFTO) and European Fairtrade Association (EFTA) (GEPA, 2015: 1).

3 Theoretical Analysis: Sustainability Characteristics and Market Prices

The following theoretical model can be formulated for a quality-differentiated market such as honey:

(1) $q^S = \alpha_0 + \alpha_1 \cdot p + \alpha_2 \cdot Z_i + \alpha_3 \cdot SUST$ (supply function)

(2) $q^D = ß_0 + ß_1 \cdot p + ß_2 \cdot Z_j + ß_3 \cdot SUST$ (demand function)

(3) $q^D = q^S$ (equilibrium condition)

q^S (q^D) is the quantity supplied (demanded) of a product, p is its price, Z_i (Z_j) refers to a vector of demand-shifting (supply-shifting) characteristics i (j) other than sustainability, and *SUST* is a product characteristic indicating the sustainability of production.

The following signs of the price and quality coefficients of equations (1) and (2) can be expected: $\alpha_1 > 0$, $\alpha_2 \gtreqless 0$, $ß_1 < 0$, $ß_2 \gtreqless 0$. If the sustainability characteristic, such as organic production or fairtrade, is valued by consumers, we can expect $ß_3 > 0$. If the sustainability characteristic induces higher production and/or processing standards this will ceteris paribus raise marginal costs: The quantity supplied at each price will, thus, be lower under ceteris-paribus conditions than for the conventional product, i.e. $\alpha_3 < 0$. Theoretically, it may happen that the sustainability characteristic is associated with declining marginal costs. If consumers value local or regional production, e.g., compared to production outside the region, lower transport costs might lead to lower marginal costs and $\alpha_3 > 0$. In a situation in which production of a food like honey occurs domestically as well as in developing countries, favourable climatic conditions may lead to lower marginal costs in deve-

loping countries. Hence, a fairtrade variant of the product may be associated with lower marginal costs than a conventional domestic product: Again, $\alpha_3 > 0$ will then hold. In general, the coefficient is a priori indeterminate: $\alpha_3 \gtreqless 0$. The sign of α_3 depends on the sustainability characteristic.

In order to elaborate how sustainability affects the market price, we can solve the equation system (1) to (3) for the situations with (*SUST* = 1) and without (*SUST* = 0) the sustainability characteristic and compare the market prices. For the product with an additional sustainability characteristic, the market price *p* can be derived by entering (1) and (2) in (3) and after some reformulations:

$$(4)\quad p = \frac{ß_0 - \alpha_0}{\alpha_1 - \beta_1} + \frac{ß_2}{\alpha_1 - \beta_1} \cdot Z_j - \frac{\alpha_2}{\alpha_1 - \beta_1} \cdot Z_i + \frac{ß_3 - \alpha_3}{\alpha_1 - \beta_1} \cdot SUST.$$

For the product with identical other features but without the sustainability characteristic the hypothetical market price *p** can also be derived from (1) to (3), now under the assumption *SUST* = 0:

$$(5)\quad p^* = \frac{\beta_0 - \alpha_0}{\alpha_1 - \beta_1} + \frac{\beta_2}{\alpha_1 - \beta_1} \cdot Z_j - \frac{\alpha_2}{\alpha_1 - \beta_1} \cdot Z_i$$

The effect of sustainability on the market price is then

$$(6)\quad \Delta p = \left(p - p^*\right) = \frac{\beta_3 - \alpha_3}{\alpha_1 - \beta_1} \cdot SUST.$$

Despite the highly stylized nature of the model, it is possible to draw some important conclusions from equation (6). If the sustainability characteristic is valued by consumers ($ß_3 > 0$), this will induce a price-raising effect under ceteris-paribus conditions. If the sustainability characteristic leads to increasing marginal costs compared to the conventional alternative ($\alpha_3 < 0$), as for organic production, this will reinforce the price-raising effect. If a sustainability characteristic leads to lower marginal costs than the conventional alternative, as it may happen for regional production or fairtrade with better climatic conditions abroad, the demand-side effects of sustainability on the market price may be mitigated. It could even happen that the product with the sustainability characteristic might be provided at lower prices: This is the case if ($ß_3 - \alpha_3$) < 0. Most likely, however, sustainability will often be associated with higher market prices and ($ß_3 - \alpha_3$) > 0. In that case, the

positive implicit price of sustainability will be higher the more price-inelastic is supply (α_1) as well as demand ($|\beta_3|$).

4 Empirical Analysis: How Sustainability Characteristics Affect Honey Prices on German Online Markets

4.1 Data

The empirical analysis combines price data from four German online food shops. The dataset consists of 426 prices, which were collected from the webshops mytime.de (82 prices), gourmondo.de (51 prices), biomondo.de (39 prices) and heimathonig.de (254 prices) in January 2015. These four online shops were chosen in order to represent the brick-and-mortar distribution channel for honey in Germany. mytime.de was selected in order to represent German supermarkets. The webshop belongs to the German Buenting E-Commerce GmbH and offers about 31,000 products. Its product range, as well as its price level, resembles a stationary supermarket. Gourmondo.de was chosen in order to reflect specialist retailers. The webshop of the Gourmondo Food GmbH offers around 17,000 international and German products and claims to be the leading German online shop for international delicacies and specialities. biomondo.de is supposed to represent organic food shops. The organic webshop also belongs to the Gourmondo Food GmbH. Yet, biomondo.de offers a reduced range of 5,000 products, that are all organically certified. 19 kinds of honey, which are offered on gourmondo.de, are sold at equal prices in the biomondo.de webshop. In order to prevent perfect collinearity, these kinds of honey are only taken into consideration in the gourmondo.de dataset. The internet platform heimathonig.de is chosen in order to mirror direct sales to consumers. Approximately 200 German beekeepers offer their honey on this platform. Local beekeepers can be found on heimathonig.de by entering a German postcode or by selecting a certain area on a map of Germany.

The retail price of 500 grams of honey constitutes the dependent variable. Prices of honey with a different weight are converted to the common 500-gram package size. All available prices of pack-

aged honey were taken into account. Albeit, delivery charges and special offer prices were not considered.[1] The Food Information Regulation (EU) No. 1169/2011 requires that all relevant product information is made available to consumers before purchase. In the case of online trade, the required information needs to be available on the relevant website of the online shop. Hence, the webshops provide information about generic product characteristics such as packaging, weight, brand, consistency, additives (e.g. herbs or nuts), the way of honey extraction and the botanical type of honey. The main variables of interest are the defined sustainability characteristics, namely organic production, fairtrade, environmentally friendly packaging and regional production. Product descriptions, as well as pictures, reveal whether a honey is produced organically and labelled with the Bioland or the EU organic label.[2] Furthermore, it is possible to see whether a honey is fairtrade and therefore carries the FLO or GEPA label. If a honey´s name contains a certain German region (e.g. "Chestnut honey from Palatinate"), it is recorded as regional German honey. The internet platform heimathonig.de shows the regional origin of each available honey and is recorded accordingly. Six German regions are distinguished in the empirical analysis. In order to define these regions, German federal states were aggregated according to whether they show homogenous landscapes and beekeeping structures (i.e. the number of bee colonies per beekeeper, the productivity of bee colonies, historical price levels for honey). The German region "North" consists of the Federal States Lower Saxony (NI), Schleswig-Holstein (SH) and Bremen (HB). "Mid-West" comprises Hesse (HE), North Rhine-Westphalia (NW), Rhineland-Palatinate (RP) and Saarland (SL). Brandenburg (BB), Mecklenburg-West-Pomerania (MV), Saxony (SN), Saxony-Anhalt (ST) and Thuringia (TH) constitute the German region "East". Bavaria (BY) represents the region "South East" and Baden-Wuerttemberg the region "South West". Hamburg and Berlin are seen as "Metropolitan Areas". Table 1 provides descriptive statistics of the variables used in the empirical estimations.

[1] If a honey was on sale, still the regular price was recorded.

[2] The hexagonal German organic label can be used voluntarily, in order to complement the EU organic label. In the empirical analysis it is not further distinguished whether a honey carries the German organic label or not. That is to say, there is no extra variable for the German organic label. Honey, carrying the German organic label in addition to the EU label, is rather considered as produced according to EU legislation and certified with the EU organic label.

With respect to sustainability characteristics, Table 1 reveals that most honey is produced and traded conventionally in the assortment of the webshops mytime.de, biomondo.de and gourmondo.de. About one third is produced organically: While one quarter is certified with the EU organic label, around eight percent is produced according to Bioland standards. The dataset contains about four percent fairtrade honey: Three percent carry the GEPA label and the remaining one percent is marked with the FLO label. Glass is by far the most common means of packaging, with 94% being sold in a glass container. With respect to the origin, 7% is produced in Germany without any further regional specification, 62% can be assigned to one of the defined German regions and is therefore considered as regional honey. Around 18% comes from a single foreign country and 13% is blended from different international origins.

The average price for 500 grams of honey amounts to 8.77 Euros, with a standard deviation of 4.64 Euros. Thus, the coefficient of variation of observed honey prices is 53%. The cheapest honey is a polyfloral honey, offered as a private label product on mytime.de at a price of 2.49 Euros per 500 grams. It is sold in a glass container and is neither traded fairly nor produced organically or regionally. Instead, it contains a mixture of honey from EU and Non-EU countries. gourmondo.de offers the most expensive honey at 9.39 Euros per 100 grams (i.e. 46.95 Euros per 500 grams). It is a liquid monofloral blossom honey, refined with additives, and is of a single-country origin. Accordingly, its glass container is labelled with a foreign brand name. The honey is neither produced organically nor traded fairly.

When comparing arithmetic means, sustainability characteristics are associated with honey prices that are above and, in some cases, below average. Organic honey, carrying the EU organic label, is sold for 9.14 Euros per 500 grams, at a price above average. Bioland-labelled honey reaches an average price level of 8.55 Euros per 500 grams with a comparatively low coefficient of variation of 18%. With respect to the origin, it is remarkable that honey from German metropolitan areas reaches an average price level much above average, most likely due to its scarcity. Honey mixtures from abroad are sold at prices below average. It is striking that fairtrade honey is sold at a price level below average, too. Honey carrying the FLO label costs 6.82 Euros per 500 grams on average and

GEPA-labelled honey has an average price of 7.09 Euros per 500 grams. A closer look at generic product characteristics reveals very high average prices for honey carrying a foreign brand name (16.81 Euros/500 grams), for honey with additives (16.40 Euros/500 grams), for non-standard ways of extraction (14.23 Euros/500 grams) and for the special honey type heather (11.93 Euros/500 grams).

Please insert Table 1 here

4.2 Empirical Model and Hypotheses

The empirical model is based on hedonic price analysis. Whereas pure consumer studies elaborate the hypothetical willingness to pay for product characteristics with survey or experimental techniques, hedonic price analysis is based on observed market data. Moreover, it was shown in the seminal contribution by Rosen (1974) that implicit prices of product characteristics are driven by the demand for and supply of those characteristics.

Many specification issues should be considered in hedonic price analysis (for surveys, see Triplett, 2006; Costanigro and McCluskey, 2011). The approach chosen here follows earlier work in two important respects: (i) With regard to the functional form of the hedonic price equation, several alternatives were estimated and compared. The log-linear specification, which is the most widely used function in hedonic analysis, fitted the data best and provided plausible and robust results. It will be presented in the following. (ii) As our data include price but not quantity information, it is not possible to estimate demand coefficients from the hedonic model as well as actual willingness to pay from a demand function. We rather concentrate on the reduced form of a supply- and demand model in which actual prices represent market equilibria and are explained by supply and demand shifters. Like in hedonic price analyses for other food markets (e.g. Schollenberg, 2012; Schröck, 2014) which address sustainability characteristics, too, price determinants include the retailer type, brands and detailed product characteristics.

The hedonic price function is estimated as a function of vectors considering online vendors (*V*), product characteristics (*PC*) and sustainability characteristics (*SC*):

$$(7)\ \log(p_i) = a_i + \sum_{j=1}^{3} b_j \cdot V_{ji} + \sum_{k=1}^{14} c_k \cdot PC_{ki} + \sum_{l=1}^{16} d_l \cdot SC_{li} + u_i$$

The dependent variable p_i is the equilibrium price in Euros per 500 grams of honey i. *a,b,c* and *d* are the parameters to be estimated and u_i is the stochastic error term. Vectors *V*, *PC*, and *SC* contain the explanatory variables, which are assumed to be exogenously given. Vector *V* represents the different online vendors. Vector *PC* consists of generic product characteristics (i.e. brand, consistency, additives, method of extraction, botanical type, weight in grams and assortments). Vector *SC* contains sustainability characteristics, being the main variables of interest. *SC* includes variables for organic production, fairtrade, packaging material and origin:

$$(8)\ \sum_{l=1}^{16} d_l \cdot SC_{li} = \sum_{l=1}^{2} d_l \cdot organic_{li} + \sum_{l=3}^{4} d_l \cdot fairtrade_{li} + \sum_{l=5}^{6} d_l \cdot packaging_{li} + \sum_{l=7}^{16} d_l \cdot origin_{li}$$

All variables, as well as their descriptive statistics, can be found in Table 1.

The explanatory variable gram can be classified as a metric variable. All other independent variables are qualitative variables. They are considered as dummy variables in the regression model. For *m* categories of a qualitative variable, (*m*-1) dummy variables may be introduced. One category remains as reference or base category (*BC*). In the basic model, the base honey is offered in the webshop mytime.de and carries a German packer´s brand name. It is a polyfloral honey without additives and it is of liquid (or other than creamy) consistency. It is extracted with common extraction methods, e.g. by means of using a spinning extractor and not pressed or scraped. With regard to sustainability characteristics, the honey is produced conventionally (i.e. not organic) and traded conventionally (i.e. not fair). The honey is sold in a glass container and is described as a blended honey from countries within the European Union and Non-European nations, without any further regional specification.

The existence of heteroskedasticity is likely to occur in cross-sectional data. Results of the White test confirm that the error term is not of constant variance. Therefore, heteroscedasticity-consistent standard errors according to White (1980) are used in the estimations. The problem of multicollinearity has to be considered already when defining explanatory variables. In order to test for multicollinearity, a Pearson correlation of the independent variables was examined. Linear correlation coefficients above 0.8 are considered to indicate troublesome multicollinearity (Gujarati, 2009, p. 338). They do not occur between the defined variables.[3]

The impact of sustainability characteristics on price is determined by preferences for as well as marginal costs of providing these characteristics, i.e. by demand and supply factors. For some defined sustainability characteristics, such as organic production, it is expected that supply- and demand-side effects work in the same direction, i.e. they increase prices. Additional costs of control and certification of organic production together with additional costly requirements for organic beekeeping (e.g. parasite medicine, bee feed) seem to explain higher marginal costs and therefore justify a price premium from a supply-side perspective. Furthermore, preceding articles reveal that consumers seem to value certified organic quality with an increased willingness to pay (WTP) for foods in general (Janssen and Hamm, 2012), particularly for fruits and vegetables (Huang and Lin, 2007), and also for honey (Cosmina et al., 2016).

Previous empirical consumer research indicates that consumers favour regional foods (Henseleit et al., 2007) and also local (Wu et al., 2015) or domestic versus foreign honey (Cosmina et al., 2016). Therefore, we posit that consumers prefer regional German honey to honey from Germany without regional traceability. On the supply side, a price premium for regional German honey seems to be justifiable, as regional honey is solely available in restricted quantities compared to honey which can be purchased and mixed from all over Germany. For all foreign honey and honey mixtures with foreign honey, a negative implicit price is expected. From a supply-side perspective, comparatively

[3] There is a high linear correlation of 0.77 between the variables 'assortment' and 'gram'. When omitting the dummy variable for assortments, statistical criteria deteriorate. This seems to be plausible, when considering that assortments do not just contain large savings packages with a particularly high weight, but also small sample-size packages with a particularly low weight.

unfavourable climatic conditions do exist in Germany as well as relatively low degrees of professionalization (EC DG AGRI, 2013, pp. 114 et seq.) and rather high wages (BLS, 2016), which apply for professional beekeepers. It is expected that lower international wages, economies of scale and better climatic conditions overcompensate costs for international transport, as honey is usually imported as seafreight in large volumes. Hence, for honey that is packaged before transportation, the effect of high international transportation costs should be depicted in the dummy variable 'foreign brand'.

A further conjecture is that honey in glass containers is sold at higher prices than in PET dispensers because of higher costs of transportation, storage and breakage. Besides, consumers might prefer its ecological friendliness, its safety for health, its flavour containing characteristics and aesthetics.

Empirical evidence suggests for other products that consumers are also willing to pay a price premium for fairly traded and produced goods (e.g. de Pelsmacker et al., 2005). Fair prices have been defined in the fairtrade standards of the FLO. The 'fair price' consists of a Fairtrade Minimum Price and a Fairtrade Premium. The Fairtrade Minimum Price covers producers´ average costs of production and is based on the honey´s quality and nature. Additionally, the mandatory Fairtrade Premium needs to be paid to the producer organisation. Its use is restricted to investment into social and economic development projects within the producing community (FLO, 2016, p. III). These arguments suggest that fairly traded honey might be priced above a conventional honey at the producer and consumer level. However, opposing impacts may also arise. On the demand side, honey is often seen as a natural product which can be supplied from the own region. Therefore, it is likely that the preference for the fairly traded foreign product honey is weaker than for coffee, cocoa or bananas where no domestic or regional substitutes coexist. Possibly, there is no or only a small additional willingness to pay for fairly traded honey by domestic consumers. On the supply side, better climatic conditions might induce a cost advantage of developing countries that could lead to lower prices than for a standard domestic honey. This effect might be stronger than the additional costs induced by the fairtrade certification. Thus, it is a purely empirical question whether the fairtrade character-

istic is either associated with a positive or a negative implicit price on the consumer market for honey.

4.3 Empirical Results

The chosen semilogarithmic model explains 69.9% of the observed variation in (the logarithm of) prices across all four online shops. Altogether 23 characteristics affect honey prices significantly at the 95%- to 99.9%-levels. Table 2 provides the estimated regression coefficients, relative price effects and implicit Euro prices.

Starting with the sustainability characteristics of special interest, it is striking that some sustainability attributes do affect honey prices significantly: 10 of the 15 estimated coefficients appear to be significantly different from zero. While parameter estimates show that organic, regional and fairtrade production affect honey prices significantly, there is no significant difference in price levels for different materials of packaging. However, the magnitude and direction of price effects vary considerably between the significant sustainability attributes: Bioland-certified honey, as well as honey from Germany (all regions and in total), honey from a foreign country and a European blend of honey, achieve significantly higher price levels, compared to the base category. A negative price effect occurs for fairtrade honey carrying the GEPA label. Positive implicit prices might arise both from additional production costs as much as from a high consumer valuation. Conversely, price discounts might be caused by particularly low costs of production just as by a reduced preference for fairtrade honey.

As expected, the price of Bioland-certified honey is significantly higher than the price of conventional honey. The regression coefficient of the Bioland dummy indicates that Bioland honey generates a price premium of 13.5%, which translates to an absolute price premium of approximately 1.19 Euros per 500 grams, while holding all other characteristics constant. Interestingly, EU organic certification does not yield a significant price bonus. As price effects are determined by supply as well as demand factors, there might be several reasons. EU organic certification seems to neither

increase production costs substantially nor leads to an increased product valuation by consumers. This finding seems to be plausible in the case of honey when considering that beekeeping requires relatively little input resources, such as bee feed or bee housing.

Please insert Table 2 here

On the demand side, it needs to be taken into account that consumers might already classify honey itself as an ecological and natural product, even if it is not produced and certified organically (Anspach et al., 2009, p. 391). Beyond EU organic legislation, Bioland standards impose additional (costly) requirements, membership fees occur and a higher product quality is required. On the demand side, it is likely that eco-conscious consumers value Bioland quality with a higher WTP. For these reasons the price premium of 13.5% is very plausible.

In general, using a blend of honey from Europe and foreign countries as the reference category, the importance of regional origin in the context of honey stands out. Compared to this base category, only Non-EU mixtures do not achieve a price premium. All other coefficients for the regional origin are significant at the 95%- up to the 99.9%-level. Table 2 depicts a high price premium for honey produced in Germany and lists price effects from 24.0% (Eastern Germany) to 54.0% (South-West). Ceteris paribus, a honey which is marked as from German origin realizes a price that is 33.3% above the price of an EU-Non-EU-mix honey. The highest price premium holds for urban German honey with 67.9% or 5.95 Euros per 500 grams. These findings suggest that consumers very clearly prefer German honey and honey from German regions to blended honey from unspecified sources.

From the supply side, it seems plausible that regional honey leads to an increased price level, as regional honey is only available in limited quantities. Especially in metropolitan areas beekeepers tend to keep fewer than average colonies of bees and total amounts of harvested honey are comparatively low. The South of Germany is characterised by its woodlands, which implies a more extensive way of apiculture. On the demand side, consumers in the South of Germany and in bigger cities, like Hamburg and Berlin, are willing to pay extra for regionally produced honey. Those preferences for regionally produced commodities are in line with previous consumer research (e.g.

BMEL, 2017, pp. 11-24). Most of the popular fir honey (which induces a price premium of 28.2% compared to polyfloral honey) is mainly harvested in the Southern German forests. A sensitivity analysis showed additionally that the implicit prices of a regional origin are very dependent of the choice of the reference region.

Descriptive statistics in Table 1 had shown that fairtrade honey reaches a subaverage price level in the examined dataset. Estimation results of the hedonic analysis comply with the finding that certified fairtrade honey yields a markdown compared to conventionally traded honey. While GEPA-labelled honey receives a price discount of 17.7% (1.55 Euros), which is significant at the 99%-level, the FLO label does not influence the honey price significantly. When interpreting estimation results, it needs to be considered that we control separately for the regional origin in the model. Therefore, the coefficients of the fairtrade variables have to be compared to the benchmark category non-fairtrade honey. On the supply side, additional fairtrade costs arise from FLO certification and the social Fairtrade Premium of 20 US-Cents per kilogram (FLO, 2016: 27). Apparently, those are overcompensated or at least compensated for GEPA- and FLO-labelled honey respectively by lower production and procurement costs compared to non-fairtrade honey. It seems to be consequent to reason that price discounts for GEPA honey, compared to non-fairtrade honey, are a result of particularly low production and procurement costs. On the demand side, it is striking that no price premium for the characteristic fairtrade is visible compared to non-fairtrade honey.

Estimation results do not yield a significant price impact of different packaging materials. PET packages will require less input, transportation and storage costs compared to glass. However, it might be that consumers appreciate PET dispensers, as those are especially convenient to use. Thus, the overall price effect of PET dispensers is theoretically indeterminate.

We can draw a general conclusion on the role of regional origin and fairtrade from these findings: The marginal willingness to pay is clearly higher for German honey and honey from German regions than for blended honey from unspecified regions and also for fairtrade-labelled honey.

Apart from the effects of sustainability characteristics, Table 2 reveals the importance of additional price determinants. Some generic product characteristics affect honey prices to a larger extent than the defined sustainability traits. Price premiums are particularly high for honey assortments (53.7%), additives such as spices, herbs and nuts (45.8%) as well as specific types of honey such as fir (28.2%) or heather (41.8%), for which harvesting is particularly elaborate. Private label honey is sold 20.8% cheaper than branded honey. Furthermore, a larger packaging size leads to a price discount per kilogram. Because of the double-logarithmic relationship between honey price and the dummy variable for packaging size, the corresponding regression coefficient of -0.3 is an elasticity: If the weight increases by one percent, the average honey price drops by 0.31%.

A high price premium is paid for honey which is labelled with a foreign brand name. Ceteris paribus, a foreign brand name induces a surcharge of 67.9% compared to a trademark. It seems likely to assume that honey carrying a foreign label is bottled abroad and not imported in bulk, but prepacked. Consequently, transportation costs will increase. Consumers seem to value these international specialties with an increased marginal WTP. It is striking that the vendor variables are not statistically significant, i.e. honey prices do not differ significantly across online shops.

5 Summary and Conclusions

The present empirical analysis assesses consumer preferences as well as producer costs of different honey attributes, with an emphasis on price effects of sustainability characteristics, namely organic certification, fairtrade, the material of packaging and regional production. The findings are based on 426 honey prices, aggregated from the four German online shops mytime.de, gourmondo.de, biomondo.de and heimathonig.de in January 2015. By means of the hedonic approach, implicit prices are estimated for sustainability characteristics as well as for further generic product characteristics.

From the empirical results, it can be summarized that sustainability characteristics matter in the online market for honey. The findings suggest that organic production and certification, fairtrade and regional manufacturing influence buyers' WTP and suppliers' costs of production respectively.

No significant effects concerning the packaging material can be verified. Results highlight further that valuation is not uniform across different sustainability characteristics. While Bioland certification and regional processing in Germany's South East, South West and Metropolises induce price premiums of 13.5%, 50.1%, 54.0% and 67.9% respectively, fairly traded GEPA honey causes a price discount of 17.7%. When interpreting estimation results, both supply- and demand-side effects on price need to be considered. High implicit prices for Bioland honey and regional German honey might arise from an increased consumer valuation as well as from higher marginal costs of production. On the contrary, negative implicit prices for fair GEPA honey might indicate low costs of production as well as a lack in consumer knowledge or preference.

Our results point to the importance of regionally produced honey for the German market although implicit prices are clearly affected by the choice of the benchmark category. This suggests that trust in the production process matters. One can imagine that consumers in the Northern parts of the world are more sceptical about the trustworthiness of producers in the South than to local beekeepers, especially while keeping different food standards and a different habitat of the bees into consideration.

Some questions remain for future research. In order to better distinguish the reasons behind the estimated price effects, a more differentiated modelling of sustainability characteristics in the hedonic analysis is needed. The negative implicit price for the GEPA label, e.g., can be due to either relatively low marginal costs of production under this label, or to lower consumer preferences for this label, or both. The reduced form of our hedonic model does not yet allow to draw conclusions on the relative importance of supply versus demand factors for the price premium observed as a consequence of a quality characteristic.

Our analysis raises one general question regarding fairtrade products: Can fairtrade become a successful differentiation strategy in markets, where it competes with regional products, as it is the case for honey in Germany? Price premiums identified in this analysis as well as recent market developments indicate that consumers are willing to pay higher prices for organic and regional products.

Exemplary empirical studies, as well as a growing number and turnover of fairtrade products, suggest that consumers interpret fairtrade as an indicator of a higher (social) quality. These findings cannot be confirmed for the online market of honey in this study. Thus, additional investigation is needed in order to clearly identify if fairtrade matters when local products are also available. To answer the posed question, it would be interesting to investigate different markets, such as flowers, wine, sugar or sweets, which allow for both regional production as well as for fairtrade.

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