# AUCTION MARKETS FOR SPECIALTY FOOD PRODUCTS WITH GEOGRAPHICAL INDICATIONS

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**Abstract:**
We present a first analysis of auction markets for specialty food products. We identify auction prices, trade volume and value for domestic and foreign origin specialty ham with geographical indications (GIs) which were actually sold in online auctions in Germany within a one-month period. Applying hedonic modeling, we examine potential factors that may influence online bidding behavior and final auction prices. We estimate positive auction price effects for weight, bidding activity, and auction length, that the domestic product is sold at a discount, that higher shipping cost have a negative impact on final prices, and that auctions ending on Fridays and Saturdays yield lower prices. The model may be used to estimate the value of GIs. In our example, we estimate relative price differences of 20-30% for the GIs of three specialty hams (Prosciutto di Parma, Jamón Serrano, Schwarzwälder).

**Key words:** consumer economics, geographical indications, auctions, information.
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## 1. Introduction

In general, auctions are a useful mechanism for sellers to ensure they get the highest price for their good without jeopardizing the trade through a fixed price set too high. Internet auctions have become a fascinating new type of exchange mechanism. Every day millions of different auctions take place online, for diverse goods ranging from antique furniture to zoom lenses. Internet auctions have significantly lowered the costs for seller to organize and for bidders to participate in auctions. Indeed, low costs appear to be the reason why auctions are used more and more often and for an ever broader range of goods. eBay is the leading internet auction site and has become synonymous for trading goods online. There are limited possibilities for online traders to sell food due to their often perishable nature and that the produce usually must be shipped to the buyer. In principle, less perishable food products as well as alcoholic beverages should be more suited for online trading. In fact, there is a relatively large market for gourmet products such as smoked ham, dried cheese, wine and spirits on the German eBay site, which is by far greater than comparable markets in other European countries and the United States. Alcoholic beverages (wine and spirits) are the most active gourmet categories on the German eBay site with over 12,000 listings of single bottles or bundles at any given time.

Due to their rising popularity, online auctions have also captured significant media attention as well as the interest of science. In particular, they represent a rich subject of study for economists who wish to understand how this new exchange mechanism works in practice. Online auctions have several benefits relative to traditional auctions. First, they offer a much more convenient way for buyers to place their bids, both geographic and temporal. Instead of physically visiting an auction house to participate in the bidding, potential buyers need not go anywhere. Traditional auctions require all bidders to participate at the same time (synchronous bidding), tying each bidder up for the entire length of the auction. Internet auctions typically have asynchronous bidding lasting for several days or weeks, giving bidders much more flexibility about when to submit their bids. Increased convenience also benefits the seller by creating a larger market for the goods being auctioned. Online traders can easily reach a large group of bidders on short notice, rather than scheduling an auction a month in advance and being restricted to local bidders who could travel to the auction at the scheduled time.

Furthermore, categorical listings for browsing and search engines make it very convenient for bidders to find the goods they are looking for.

However, internet auctions also have disadvantages relative to in-person auctions. First, it is hard for bidders to inspect the goods before placing a bid. Online auctioneers try to mitigate this problem by using technology in several ways: sellers may post electronic images and/or provide text descriptions of their items as well as answer buyers' questions via email. Buyers also have reasons to be distrustful of any claims made by sellers. This is obvious when bidders are better informed about the value of a good than its seller. Even if sellers know the value buyers place on their goods, in a search equilibrium there is little reason to expect that sellers of low value goods will truthfully advertise themselves as such. This is because doing so will reduce the probability of a successful transaction, as search effort is costly and buyers exert less effort in pursuit of sellers advertising low quality. Another potential problem with online auctions is fraud. With traditional auctions, the goods can be exchanged directly for money. With Internet auctions, winning bidders must trust that the seller actually sends the good in return for their payment. Indeed, there have been reported cases of fraud in online auctions, but the numbers are tiny compared to the transactions taking place.

Apart from traditional auctions, another point of comparison for online auctions are newspaper advertisements. Many of the items sold by in online auction are similar to items found in newspaper ads. In fact, online auctions can also be cheaper than a traditional newspaper ad (partly because online listings are do-it-yourself, thus saving labor costs). By matching buyers and sellers, online auctions can improve efficiency: items which may not be sold for a lack of local interest, can now find their way to distant buyers. Further, by using an auction, the seller is relieved of the responsibility of choosing a price for an item with uncertain demand. Rather than setting a price too-low which will allocate the good to the first person calling, or setting the price too-high such that the good cannot be unsold, the seller can use an auction and let the market determine the price.

In what follows, we present an introduction to the online auction market, paying particular attention to features that may be of interest to agricultural economists. What types of food products are sold in online auctions, what is the volume of trade, and what types of auction formats used? The rates of change in this dynamic market imply that we may only give a snapshot at a particular point in time. We will examine online auction markets for selected food items during the months of December 2004 and January 2005 and present data on from the German eBay site collected during that time

period.  The remainder of this paper is organized as follows. Section 2 gives a brief review of the auction literature with a focus on recent work related to online auctions. Moreover, we discuss the auction format typically used in online auctions. In Section 3, we provide a brief overview of the types of food products that are sold in online auctions. Section 4 introduces our data set for three specialty hams (Parma, Serrano, and Schwarzwälder) protected geographical indications (GIs) in the European Union, which are auctioned on the German eBay site. The modeling approach is used to analyze online auction pricing, but also serves as a tool to estimate the value of geographical indications (GIs). In section 5, we present the results of an empirical analysis using a hedonic model to analyze potential factors that influence online buying behavior and final auction prices. In Section 6, we summarize and discuss the results and then conclude.

## 2. The (Online-)Auction Literature

Auctions have been extensively studied by economists to understand their properties as a dynamic pricing mechanism (e.g. Vickrey, 1961; Milgrom and Weber, 1982; McAfee and McMillan, 1997). This literature involves both analytical models and empirical testing. The different auction mechanisms studied include the English auction (or ascending-bid auction), the Dutch auction (descending-bid auction), the first-price sealed-bid auction, and the Vickrey auction (second-price sealed-bid auction). For a comprehensive and in depth overview of the literature on auction theory we refer to Klemperer (1999).

Ascending-bid online auctions are by far the most common. To set up such an auction, the seller must always provide verbal description of the item and may also upload a digital picture for display. When listing the item, an online webpage is created that displays the information provided by the seller along with the current high bid. Potential bidders must decide whether to place the first bid and/or to raise the current high bid. This can be done by filing an online bid into a text box shown on the same web page. After submitting their bid, the auction status will automatically update and show whether the submitted bid has been successful, i.e. has become the current high bid. Bidders may then return at any time before the auction closes to check on the current status. In order to make bidding easy for its users, eBay provides a list of all auctions in which you have place a bid and allows you to create a list of all auction in which you are interested in and may want to place a bid in the future. It will also notify you instantly via email when your current bid is no longer the highest.

Ascending-bid online auctions are somewhat different than standard English auctions where the auctioneer uses the familiar "it's going.. it's going.. it's gone" procedure to close the auction. Since bidders need not be present in one geographical location, online auctions provide an extended temporal horizon for them to place their bids. In any standard eBay auction, the seller must decide on a specific auction length (up to ten days) and starting time, which will define the exact closing time and day in advance. The literature has noted that this leads to a severe incentive problem: if the auction closes at a fixed time, bidders have no incentive to place an early bid in the auction (e.g. Roth and Ockenfels, 2002). Many bidders in eBay auctions engage as "snipers" (i.e. filing a bid which just barely beats the high bid in the final minute of an auction leaving no time to respond for other bidders). The strategy of filing a late bid just before the auction ends dominates the strategy of filing the same bid somewhat earlier. When all bidders follow this strategy, the bidding game becomes equivalent to a first-price, sealed-bid auction, where all bids are submitted at the very end. This will effectively eliminate the most attractive feature of any ascending-bid auction, i.e. that bidders have a dominant strategy to bid up to their maximum willingness to pay. In order to restore this attractive feature, two alternative mechanisms have been suggested to encourage earlier bidding in ascending-bid online auctions.

The first mechanism is an "it's going.. it's going.. it's gone" procedure to the auction, involving a short "temporal extension" of say ten minutes. It means that any bid placed in the last ten minutes of an auction will extend the auction's length by another ten minutes. Hence, an auction does not end until ten minutes have passed without a new bid, giving bidders an opportunity to protect themselves against "snipers." However, now the problem is that serious bidders must visit the auction during the final minutes and stay with it until it is over, effectively removing the flexibility for bidders to enter their bids at any time during the auction period. Lengthening the extension period would counter this temporal bidding inconvenience, but at the cost of having an unpredictable auction ending time.

A second mechanism involves so-called "proxy bidding," making the fixed-length ascending-bid online auction somewhat equivalent to a Vickrey second-price sealed-bid auction. However, it implicitly assumes a private-value auction-bidding model where bidders know with certainty their own valuation for an item. Note that this equivalence does not apply to other auction models such as Milgrom and Weber's (1982) affiliated-values model, which do not imply a strict equivalence between English and second-price sealed-bid auctions. Proxy bidding works as follows: Bidders are strongly encouraged to always place a bid up to their maximum willingness to pay. However, the current high

bid being displayed online will be just above the second-highest bid by a certain amount of say 50¢. Hence, when you are the current high bidder, your maximum bid which is unknown to the other bidders may be much higher. Other bidders who place a bid that is just above the current high bid do not know whether they get the winning bid. Moreover, snipers who file a bid which barely beats the current high bid in the final minute of an auction may still not get the winning bid. Hence, this mechanism will eliminate incentives for "sniping" and restore the dominant strategy of bidding one's maximum willingness to pay.

In markets with asymmetric information properties, economists worry about adverse selection (i.e. sellers may have hidden information about the quality of the good). Akerlof (1970) is pessimistic about whether markets are able to function with adverse selection. He demonstrates that when only the seller knows whether a used car is a "lemon" at the time of sale, it could be that there is no equilibrium where cars are being sold. Other authors (e.g. Shapiro 1983) have suggested that reputation indicators might be a mechanism that allows markets to function in the presence of adverse selection. If sellers gain a reputation for honest behavior, such as making full disclosure of all information about a particular product, then markets can have a positive level of trade. All online auction sites attempt to solve this information problem through some form of a user feedback system. For instance, after an auction is completed, eBay allows both the seller as well as the winning buyer to rate one another in terms of their reliability and timeliness in payment and delivery. The ratings are given as a positive, negative or neutral response. The number of net positive responses is the seller reputation score displayed next to each user's eBay identity, which is usually a pseudonym or nickname. By clicking on a seller's eBay ID, potential buyers can view all of the seller's feedback, including all comments as well as statistics totaling the total number of positive, neutral and negative comments.

Bajari and Hortacsu (2004) provide an excellent overview of the recent literature on online auctions. Their paper also includes a review of studies that have used data collected directly from online auction sites to analyze customer-bidding behavior. Lucking-Reiley (2000) present an overview of what is auctioned online and how is auctioned off. Lucking-Reiley et al (2000) analyze online auction prices for collectible one-cent coins on eBay. Their main findings are that the user reputation indicator (i.e. feedback ratings) have a measurable effect on auction prices (negative ratings have a much greater impact than positive ratings), minimum bids and reserve prices have positive effects on the final auction price, and that on average longer lasting auctions result in significantly higher prices.

Resnick and Zeckhauser (2001) find that reputation ratings may have a positive price effect. Several studies also provide estimates for the value of reputation in online auctions (e.g. Houser and Wooders, 2000; Lucking-Reiley et al., 2000). A common finding by all authors is that any negative feedback (user reputation) is negatively correlated with the sale price and that the amount of positive feedback has a significant positive impact on the sale price. However, the estimates on how much the winning bid would increase as a function of a seller reputation are rather small. Houser and Wooders (2000) estimate that a ten percent increase in positive feedback points increases the winning bid by only 0.17% and a ten percent increase in negative comments reduces the sale price by 0.24%. Lucking-Reiley et al. (2000) find that a one percent increase in the seller's positive feedback raises prices by 0.03% and a one percent increase in negative feedback decreases prices by 11%.

Wilcox (2000) found that more experienced bidders tend to bid more rationally than less experienced bidders. Analyzing eBay data for rare coins, Wood and Kauffman (2001) identified four trends that may explain why auction buyers pay more or less for the same item: weekend, auction length, reputation score, and picture effects. Auctions ending during the weekend yielded higher prices than auctions ending on weekdays (weekend effect). Thus, a weekend effect would be a personal characteristic, not a market characteristic and may indicate that people are willing to pay more for the same item when they have more time to consider the purchase. Auctions that last longer attract more bidders and thus higher prices (auction length effect). Seller reputation may also yield a price premium (reputation score effect). However, since eBay reputation scores tend to increase with time and activity it may in fact measure experience rather than reputation. Moreover, Wood and Kauffman (2001) suggest that items sold online and shown with an actual picture might also sell for a premium (picture effect). As they suggest that this might be due to demanding buyers who expect sellers to present all information available using advanced technology. We would argue that this might no longer be accurate since digital imaging has become almost an everyday household application today.

In addition to the online specific indicators analyzed in other studies, we take a closer look at the effects of the auction ending time during the day on the final bids. We argue that the timing of the final bid *by the seller* has received relatively little attention in the literature. Analyzing buyer behavior, Roth and Ockenfels (2002) have examined the phenomenon that experienced buyers tend to bid during the very final phase of an eBay auction (sniping). Moreover, we also examine an array of distinct product quality attributes, which have been analyzed in hedonic models using retail prices. We will

argue that an analysis of online auction prices that includes distinct product quality attributes will render most online specific variables to have insignificant impacts on final auction prices. Our application is unique in scope and detail because online specific variables have not been analyzed in conjunction with product quality attributes typically examined in hedonic models using retail prices.

## 3. Online Food Auctions

In this section, we provide a brief overview of the types of food products that are available in online auction markets. For this purpose, we compare the two largest eBay sites worldwide: Germany and the United States. Table 1 lists the main gourmet food/beverage categories along with a simple offer count on December 21st 2004 and on January 25th 2005. Although the overall eBay market in terms of the total number of items on offer at any given time is about 2½ times larger in the U.S., there are about 3 times more listings in the gourmet food/beverage categories on the German site.

**Table 1. eBay Gourmet Food/Beverage Categories.**

| Germany (ebay.de) Gourmet | 2004 21.12. | 2005 25.1. | % +/- | U.S.A. (ebay.com) Food & Wine | 2004 21.12. | 2005 25.1. | % +/- |
|---|---|---|---|---|---|---|---|
| Sweets & Chocolates | 1,848 | 2,760 | 49% | Candy, Chocolate | 1,626 | 2,112 | 30% |
| Breads, Cakes & Cookies | 379 | 416 | 10% | Cereals, Grains, Pasta | 93 | 121 | 30% |
| Cheese | 526 | 575 | 9% | Cheese, Crackers | 59 | 94 | 59% |
| Coffee | 2,001 | 2,424 | 21% | Coffee, Tea | 1,991 | 2,371 | 19% |
| Non-Alcoholic Beverages | 281 | 398 | 42% | Cookies, Biscotti | 243 | 295 | 21% |
| Champagne/Sparkling Wine | 902 | 779 | -14% | Desserts | 472 | 484 | 3% |
| Fruits & Vegetables | 223 | 271 | 22% | Fruit, Nuts, Seeds | 260 | 274 | 5% |
| Alcohol Beverage & Spirits | 4,317 | 4,886 | 13% | Honey, Syrup / Sweetener | 193 | 224 | 16% |
| Asian Food | 322 | 376 | 17% | International Foods | 168 | 244 | 45% |
| Basic & Specialty Food | 2,025 | 2,056 | 2% | Jams, Jellies & Preserves | 161 | 112 | -30% |
| Meats & Sausages | 1,783 | 1,779 | 0% | Meat, Poultry & Seafood | 685 | 555 | -19% |
| Fish & Seafood | 464 | 496 | 7% | Oils, Condiments & Sauces | 599 | 676 | 13% |
| Tea | 1,317 | 1,423 | 8% | Soups, Stews | 67 | 77 | 15% |
| Spices & Seasonings | 1,367 | 1,468 | 7% | Spices & Seasonings | 1,046 | 1,112 | 6% |
| Wine | 7,917 | 8,454 | 7% | Wine | 413 | 340 | -18% |
| Cigars & Tobacco | 1,642 | 2,063 | 26% | Other Food | 556 | 1,097 | 97% |
| **Total** | **27,314** | **30,624** | **12%** | **Total** | **8,632** | **10,188** | **18%** |

Source: www.eBay.de and www.ebay.com with own calculations.

In terms of the overall importance among all product categories, the gourmet food/beverage categories are minor. However, these auction markets are very dynamic and exhibited significant growth rates for most categories over the period that we observed. Nevertheless, only about 1% of all

current offers fall in the gourmet food/beverage category on the German site, while in the U.S. it is less than 1‰. Therefore, we restrict our more detailed analysis to the listings on the German eBay site, where wine is by far the most important product categories with over 8,000 listings (strict laws severely restrict alcohol trade within and between states in the U.S.). Wine together with other alcoholic beverages and spirits comprise about half of all offers within the gourmet food/beverage category on the German site. Among the gourmet food categories auctioned on the German site, basic& specialty food, sweets & chocolates, and meats & sausages are roughly equal in importance.

In terms of their suitability for online auction trading, we would expect that food product categories exhibiting a high degree of quality differentiation that are not commonly available in any next-door supermarket are most important. The value that buyers place on a food product purchased in an online auction must reflect a significant premium for exclusivity in order to justify shipping costs which in some instances even exceed the final auction price. This seems to be especially true for premium wine where many online auctions involve rare bottles that are not easily available anywhere else. Moreover, because of their often-perishable nature, we would expect that the possibilities to sell food products online are more restricted than for other goods. This expectation is reflected in the limited amount of perishable food products such as soft cheeses or raw meat on offer in online auction markets. However, when a food product has a significant degree of exclusivity for potential buyers and when it can easily be shipped to the buyer without deteriorating in quality, it may become sensible for sellers to offer it in an online auction. Hence, we do observe much larger online auction markets for gourmet food products such as smoked ham, dry cheeses or specialty coffees.

## 4. Food Auction Data

We will now introduce a data set for a comparable sub-category of food, which was auctioned on the German eBay site. The data was collected with the objective to analyze the online auction mechanism for a sample food product category as well as potential determinants of final online auction prices. In order to obtain a reasonably sized data set of comparable food products, we choose three different specialty hams (Prosciutto di Parma, Jamón Serrano, Schwarzwälder Schinken), which were auctioned on the German eBay site during the months of December 2004 and January 2005. Note that all three names are protected geographical indications (GIs) in the European Union, either through protected designation of origin (PDO for Prosciutto di Parma and Schwarzwälder Schinken) or traditional specialty guaranteed (TSG for Jamón Serrano). However, due to the online nature of the

auctions examined it is not possible to verify whether all the products offered under such names actually confirm to the quality regulations pertaining to these names.

**Table 2. Characteristics of the Data Set.**

|                              | Parma    | Serrano  | Schwarzw. | Total    |
| ---------------------------- | -------- | -------- | --------- | -------- |
| Transactions (n)             | 618      | 621      | 260       | 1499     |
| Product value (€)            | 14787.97 | 16718.17 | 3314.62   | 34820.76 |
| Quantity sold (kg)           | 1884.17  | 2383.70  | 445.29    | 4713.16  |
| Total shipping costs (€)     | 4959.6   | 4955.3   | 1492.7    | 11407.60 |
| Av. product value (€/kg)     | 7.85     | 7.01     | 7.44      | 7.39     |
| Av. transaction value (€/n)  | 23.93    | 26.92    | 12.75     | 23.23    |
| Av. quantity sold (kg/n)     | 3.05     | 3.84     | 1.71      | 3.14     |
| Av. cost per shipment (€/n)  | 8.03     | 7.98     | 5.74      | 7.61     |
| Shipping cost per kg (€/kg)  | 2.63     | 2.08     | 3.35      | 2.42     |
| Number of bids placed        | 5631     | 4732     | 1714      | 12077    |
| Bids per transaction         | 9.1      | 7.6      | 6.6       | 8.1      |

Source: www.eBay.de with own calculations.

In Table 2, we provide some key characteristics of the data set including of 1499 transactions. The total product value for all transaction was 34820 €. Total quantity of ham traded was equal to 4713 kg and about half of it was Jamón Serrano. On average, the shipping costs amount to about to ⅓ of the total product value. The average product value (i.e. the average bid or willingness to pay per kg of product excluding shipping) is about 7.40€. It is highest for Parma (7.85€) and lowest for Serrano (7.01€), which is probably due to the fact that the auctioned Serrano ham has more bone more bone content than Parma and Schwarzwälder ham. The average transaction value is 23.23€ (or 30.84€ including shipping). It is highest for Serrano (26.92€) and lowest for Schwarzwälder (12.75€). The average quantities sold are also very different mainly because Parma and Serrano are often sold as large chunks (also including bones) while Schwarzwälder is sold in smaller cuts without bones. Hence, we observe the lowest average cost per shipment (5.74€), but the highest shipping costs per kg (3.35 €/kg) for Schwarzwälder. With respect to the bidding behavior, we observe the most bids per transaction for Parma ham (9.1). This factor ought to contribute to the higher final auction prices per kg that is received for Parma, as we will analyze later.

eBay allows auctions to last for 1, 3, 5, 7, or 10 days, but most of the auctions in the sample (about 80%) last for only one day with the remainder about evenly split between the other allowed auction periods. In any standard eBay auction, the seller must decide on an initial price as well as on a

starting time and how long an auction will last (up to ten days) which then defines the exact closing time and day in advance. Thus, the timing of the auction end is of some relevance to the seller as it may affect the final bid, especially when buyers do not bid up to their maximum willingness to pay early in the auction, despite being encouraged to do so with proxy bidding. With respect to the auction end, the distribution is about uniform with around 215 +/– 20 transactions for each day during the week. Auction ending times are somewhat skewed towards the evening hours with about half of all auctions ending between 1800 and 2300 hour CET. With respect to initial pricing, about 80% of all sellers choose to start their auctions at minimum price which is equal to 1€.

## 5. Empirical Analysis

In this section, we estimate two empirical models to analyze potential factors that may influence online buying behavior and may affect final online auction prices. We use the data set for specialty ham characterized above. Main quality attribute is a qualitative indicator that characterizes the type of ham (Prosciutto di Parma, Jamón Serrano, Schwarzwälder). Moreover, we have data on the weight of the ham auctioned, the number of bids place in the auction, the cost of shipping the product which is usually paid by the buyer, the length of the auction as well as the weekday and time during the day when the auction ended.

For the first model [Log(Price)], we assume that buyers take the shipping costs as given. Hence, we relate final transaction values without shipping to a set of independent variables including a qualitative indicator for the type of ham, the product weight, the number of bids placed, the shipping costs, the auction length as well as qualitative indicators for the auction end (weekday and time during the day). For the second model [Log(Price+Ship)], we assume that buyers include shipping costs in deriving their maximum willingness to pay. Hence, we relate final transaction values plus shipping to the same set of independent variables – of course without including shipping as an independent variable. We can expect a positive sign on the estimated coefficients for weight and number of bids placed. Higher shipping cost should have a negative impact on the final auction price. Moreover, as argued before, longer lasting auctions should attract more bidders and thus lead to higher prices. The results for both models are presented in Table 3. Note that in both models the base category is auctions for Schwarzwälder ending Sundays 8pm - 9pm.

When examining Table 3, we observe comparable results for both models. All signs are as expected, but the second model performs somewhat better in terms of the overall goodness of fit ($R^2 = 84.6\%$). The first model ($R^2 = 79.5\%$) confirms that in an online auction, higher shipping costs have a significantly negative impact on the willingness to pay when buyers regard them as exogenous. In the following discussion, we will however focus on the second model because it seems more appropriate to assume endogenous shipping cost when their share of the total purchase price is about ⅓ on average and in some instances even exceeds the final bid. Relative to Schwarzwälder, Parma sells for a premium of 23.2% and Serrano at a premium of 14.6%. At the average transaction value of 30.84€ including shipping, another kilogram of product will add 5.74€ to the final bid. Note that the standard postal shipping rate in Germany (up to 5kg costs 7€) allows to add another kilogram of product to the average quantity sold in a transaction (3.14kg) without raising the shipping cost. The other coefficients may be interpreted as follows: an additional bid will add on average about 34¢ while another auction day will add only about 37¢ to the final auction price. Both of these values are very low and seem to support the observation that most auction only last for one day.

Next, we turn to the effects related to the timing of the auction end. Our results suggest a negative weekend as opposed to Wood and Kauffman (2001). Auctions ending on a Friday (-6%) or Saturday (-3.7) both yield significantly lower final prices while all other days are not significantly different from Sundays. Since most people do their normal shopping on Fridays and Saturdays, they may be less inclined to follow an auction and/or shop for food online.

With respect to the time of day an auction ends, our results are mixed. We have grouped sensible timeframes such as the night, morning and afternoon hours together when most people follow a certain daily routine. During the evening hours when most online auction trading takes place, we look at each hour separately. With the exception of the morning and late afternoon hours, all other timeframes carry a significant premium between 5% and 11% relative to the base period between 8pm and 9pm, during which about 1/7 of all auctions ended. When reflecting on this result, we notice that all significant price differentials are positive relative to the base period. This suggests that the expected prices are lower during the base period (8-9pm) as well as in the morning and late afternoon when potential buyer will most likely do other things than go online and bid in an auction.

**Table 3. Estimation Results[†].**

| Dependent Variable | LOG(PRICE) | | | LOG(PRICE+SHIP) | | |
|---|---|---|---|---|---|---|
| Variable | Coefficient | t-Statistic | Prob. | Coefficient | t-Statistic | Prob. |
| CONSTANT | 2.207*** | 22.842 | 0 | 2.462*** | 43.849 | 0 |
| PARMA | 0.330*** | 9.014 | 0 | 0.232*** | 16.067 | 0 |
| SERRANO | 0.201*** | 6.183 | 0 | 0.146*** | 8.236 | 0 |
| WEIGHT | 0.266*** | 19.332 | 0 | 0.186*** | 38.896 | 0 |
| NUMBER OF BIDS | 0.017*** | 7.651 | 0 | 0.011*** | 6.995 | 0 |
| SHIP | -0.062*** | -3.120 | 0.002 | --- | --- | --- |
| AUCTION LENGHT | 0.016*** | 3.841 | 0 | 0.012*** | 3.549 | 0 |
| MONDAY | -0.005 | -0.204 | 0.838 | 0.001 | 0.063 | 0.950 |
| TUEDAY | -0.002 | -0.104 | 0.917 | -0.005 | -0.322 | 0.747 |
| WEDNESDAY | -0.004 | -0.188 | 0.851 | -0.002 | -0.135 | 0.892 |
| THURSDAY | -0.012 | -0.484 | 0.629 | -0.012 | -0.705 | 0.481 |
| FRIDAY | -0.085*** | -3.133 | 0.002 | -0.060*** | -3.273 | 0.001 |
| SATURDAY | -0.049** | -2.072 | 0.038 | -0.037** | -2.212 | 0.027 |
| Time 23-08h | 0.183*** | 6.188 | 0 | 0.113*** | 6.087 | 0 |
| Time 08-12h | 0.043 | 1.635 | 0.102 | 0.014 | 0.924 | 0.356 |
| Time 12-17h | 0.072*** | 2.709 | 0.007 | 0.036** | 2.288 | 0.022 |
| Time 17-18h | 0.106** | 2.030 | 0.043 | 0.052 | 1.338 | 0.181 |
| Time 18-19h | 0.153*** | 4.194 | 0 | 0.096*** | 3.901 | 0 |
| Time 19-20h | 0.072** | 2.150 | 0.032 | 0.038* | 1.763 | 0.078 |
| Time 21-22h | 0.132*** | 3.925 | 0 | 0.091*** | 3.979 | 0 |
| Time 22-23h | 0.083*** | 2.780 | 0.006 | 0.045** | 2.418 | 0.016 |
| R-squared | 0.795 | | | 0.846 | | |
| Adjusted R-squared | 0.792 | | | 0.845 | | |
| S.E. of regression | 0.259 | | | 0.180 | | |
| S.D. dependent variable | 0.568 | | | 0.457 | | |
| Durbin-Watson statistic | 1.889 | | | 1.857 | | |

[†] Least Squares with White Heteroskedasticity-Consistent Standard Errors & Covariance
***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

With our empirical model, we estimate significant relative price differences for the three types of ham analyzed. The domestic product (Schwarzwälder) although it may also exhibit a high degree of quality differentiation should be more commonly available in any next-door supermarket and thus does not exhibit the degree of exclusivity that online buyer will be looking for in order to be willing to pay a significant amount for having the product shipped to their home. As argued before, the value that buyers place on a food item purchased online must reflect a significant premium for exclusivity in order to justify shipping costs which in some instances may even exceed the final auction price.

## 6. Discussion and Conclusions

In this paper, we presented an introduction to online auction markets for food and beverage products and provided a brief overview of the types of products that are available in online auctions. Using a specific example of food items actually sold (three types of special quality ham differentiated by EU protected special nomenclature), we identified statistics on the volume and value of trade and the final auction prices received as well as indicators that characterize buyer bidding behavior. The ongoing dynamics of this developing market imply that we could only provide a one-time snapshot of a particular online auction food market exhibiting fairly active trading.

To set the stage, we provided a brief review of the auction literature with a particular focus on recent research related to online auctions and discussed in some detail the format that is typically used in online auctions. We analyzed a detailed data set of the three specialty hams (Parma, Schwarzwälder, Serrano) protected geographical indications (GIs) in the European Union and auctioned on the German eBay site between December 6th 2004 and January 6th 2005. The final product value for all transactions in this data set was about 35000 € and the quantity traded just over 4700 kg. The average product value for a transaction was 23.23€ (30.84€ including shipping costs).

Objective of the empirical analysis was to analyze potential factors that influence buying behavior and determine final online auction prices. Moreover, we suggest that using a hedonic model, auction data can be used to estimate a value for geographical indications (GIs). We estimate two different setups with the dependent variable modeling whether or not buyers include the shipping cost in their bidding decisions (i.e. maximum willingness to pay). We found that the domestic product in the sample (Schwarzwälder), although comparable in quality, is sold at a discount of 20-30% relative to the foreign product. We argue that this price differential is due to exclusivity effects. Comparable domestic products are widely available in any next-door supermarket and thus do not exhibit a significant degree of exclusivity that online buyer are looking for in order to be willing to pay the shipping cost which on average are about ⅓ of the final product value.

Along with theoretical expectations, we estimate positive coefficients for weight and the number of bids placed in an auction. We also verify that higher shipping cost have a negative impact on the final auction price. Longer lasting auctions attract more potential buyers and thus lead to higher prices. Our data set confirms a positive but small auction length effect as suggested by Wood and Kaufmann (2001). We also estimate that lengthening an auction by one day would add about 37¢ to

the final auction price on average while an additional bid would add about 34¢. Both of these values are small and support the (observed) decision by sellers to offer mostly shorter auctions lasting only one day. However in contrast to other studies examining non-food items, our results suggest a negative weekend effect for food items. Auctions ending on Fridays and Saturdays both yield significantly lower final auction prices. We argue that during the weekend (especially Friday afternoon and Saturday morning), most Germans engage in their normal shopping routine and may be less inclined to follow an online auction and shop for something that they could also grab somewhere else.

Finally, we obtained mixed results with respect to the time of day an auction ends. While we estimate significant differences between certain timeframes during the day, these effects may be mostly due to the readiness of buyers to go online and bid in an auction. This is suggested by fact that all estimated price differentials are positive relative to the base period between 8pm and 9pm when most people might want to do other more important things (e.g. eat, watch TV).

This study represents a unique and first attempt to analyze online auction markets for food products. The results of this study yield some interesting conclusions with respect to online buying and bidding behavior. However, online auctions are a very dynamic market environment. We reiterate that this analysis is only a one-time snapshot of an online auction market for a specific product group (specialty ham), which exhibited a fairly active trading during the period of data collection. Whether the more general results also hold for other quality differentiated food products sold in online auctions would warrant further studies. In particular, we would like to improve on this paper by studying further indicators of bidding behavior such as the impact of initial threshold pricing on the success of online auctions or whether late bidding influences online auction markets for food. Fortunately for economists, online auctions are a rich data source for empirical studies as well as a fascinating subject to study behavioral models in practice.

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