INTERNET AUCTIONS: DESCRIPTION, BIDDERS' PROFILES AND IMPLICATIONS

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ABSTRACT: The increasing quantity of items bough and sold over the internet led to the success of internet auctions, to the introduction of new auction rules and the creation of new businesses and merger among existing ones. In this paper, we present a description of existing internet auction rules and typical profile of consumers who use them. We found that bidders are most likely located in the U.S., have some internet experience and skills and that they belong to the 26-50 years old age group. We also discuss the implication of online auctions on resource allocation.

1. INTRODUCTION

Auctions have been used to allocate a large amount of resources at least as far back as the 5th century BC in Babylonia (Milgrom and Weber 1982). Highly structured auctions have evolved for livestock and art and have been common for hundreds years. More recently, auctions are being used to sell resources among individuals, businesses and/or organizations and governments. However, it is likely that the total value of all merchandise auctioned over internet sites since their advent exceeds the total value of all items auctioned off up to then. The sheer

[§] I would like to thank A. Lai for her useful insights and for sharing her own experience with internet auctions, and M. Ward for useful comments. The Usual disclaimer applies.

volume of merchandise auctioned over the internet is staggering and is likely to grow substantially. In this paper, we describe some of the items sold in internet auctions, features of these auctions, and the people bidding in those auctions.

Consumer acceptance has led to both a proliferation of items auctioned off and in online auction houses. Most of the items offered for sale at auctions are common items, e.g., electronics, jewelry, collectibles. However, some items have been unconventional, such as a complete Tyrannosaurus Rex skeleton (USA Today, Jan. 17, 2000), fashion models' ovarian eggs where the bids seemed to reach $42,000 per egg (Wilson 1999) and class registration time at a university where the bids reached $71 (Myers 1999).[1] EBay is the leading internet auction site and is one of the few internet companies that have consistently reported profits. New auction sites have emerged to capture some of the market potential.

Features of an auction and item being sold depend on the parties buying and selling. Internet auctions are categorized as business-to-business (B2B), businesses-to-consumer (B2C) and consumer-to-consumer (C2C).[2] B2B can be thought of as a logical extension of either electronic data exchange or 'real' auctions in which an auction event attempts to overcome thin market problems. B2C and C2C represent a rather radical departure from traditional consumer oriented marketing. Economies of scale typically lead to marketing to consumers to be done by retailers selling larger volumes of standardized products. In contrast, the advent of internet auctions has made transactions for smaller volumes of highly specialized products viable.

Economic models of auctions justify their use by the existence of asymmetries between sellers and potential buyers in the valuation of the item offered for sale. In many situations, like

[1] Before its closure by the seller to avoid possible violation of university rules (http://www.illiniauction.com). EBay recently disallowed a proposed auction in which someone wished to sell his soul on the grounds that, if it did not exist, the sale would constitute fraud while, if it did exist, it would be immoral.
[2] This terminology is borrowed from Beam and Segev (1998).

in procurement contracts or the sale of any item in general, the most efficient agent or the one who places the highest value on the item cannot be singled out. Auctions allow the seller to extract this information from potential buyers. The economic literature generally finds that the choice of the auction procedure used is crucial to payoffs, bidding strategies, and market efficiency. The auction procedure is said to be efficient if it does not allow the existence of a second market, which implies that the buyer is indeed the one who values most the item.

The classical types of auctions are the first price sealed bid auction, English auction, Dutch auction, Japanese Auction and the second price sealed bid auction, named also Vickrey's auction, after its designer and is not used very often for reasons explained in Rothkopf, Teisberg and Kahn (1990).[3] Many varieties of auctions are being used in different settings, such as the share auction (Wilson 1979), the introduction of reserve price, participation fee, and minimum bid increment. A summary of their results and applications are available in Engelbrecht-Wiggans (1980), McAfee and McMillan (1987), and Wilson (1992) to name just as a few.

Traditionally auctions are held at market places or in auction houses where bids are made in person or submitted via mail and phone. Since the development of internet use and electronic commerce, auctions are being held in the cyberspace that form of auction is referred to by internet auction or online auction. By online auction, we target interactive auction through the internet and not the use of the internet just to post an update of bids, the use of e-mail to submit bids, the use of the internet to post requests for proposals, or to publicize an auction. The internet offers the advantage of a greater reach hence reducing the problem of lack of bidders and rigging that are observed in some traditional auctions. Internet auctions present many interesting features such as the trade of items that were not auctioned off previously, those products range

from items the least useful for many, to items that might be shocking or unconventional for some, such as Tyrannosaurus Rex skeleton, ovarian eggs, etc… However, internet auctions do not cover only odd and insignificant products because many websites host auctions for art pieces, diamonds and automobiles. Internet auctions brought a new jargon and a new environment for all parties in an auction and any attempt to list them all is impossible since features vary across auction websites, but one can still name some popular auction websites such us eBay[4], Ubid[5], Onsale[6] and Haggle[7].

In this paper, we offer a description of internet auction based on what is available in the guidelines and rules sections of auction sites (section 2). Using a dual-scaling technique we attempt to set a profile of people who are likely to participate in an internet auction (section 3), we found that bidders are most likely located in the U.S., have some internet experience and skills and that they belong to the 26-50 age group. In a following section (section 4), we look into the implications of internet auctions on the bidding behavior of buyers, the merger between auction houses and auction websites, the economic efficiency, and the dissemination of information. In the conclusion (section 5), we summarize the main findings.

2. DESCRIPTIVE FEATURES OF INTERNET AUCTIONS

An auction can be described by its three components: the participating parties, the item auctioned off, and a specific set of rules that govern interactions between buyers and sellers. Internet auctions do not make exception to that, they rather introduced new elements to each of these components; in this section we attempt to define each of the above components.

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[3] Lucking-Reiley (2000) argues that the second price auction existed before Vickrey (1961) showed its characteristics.
[4] http://www.ebay.com
[5] http://www.ubid.com
[6] http://www.onsale.com

2.1. Participating Parties

Traditionally auctions are held among consumers (C2C) or collectors, among businesses (B2B), between businesses and consumers (B2C), between governments and consumers, and between governments and businesses.[8] Governments' participation in internet auction is scarce; to our best knowledge, the only existing experience is the internet auction conducted by New Zealand's Ministry of Commerce to sell radio spectrum in February 1998[9]. C2C internet auctions involve end-users amongst themselves and their transactions represent the lion's share of auction postings and are present on the majority of internet auction websites. B2C internet auctions usually involve businesses selling services and goods to end-users, and they are the second biggest share in internet auctions volume; however, B2C auctions have a higher response rate or realized sales (Beam and Segev, 1998) than the C2C auctions, probably because of the credibility and security factors. B2B auctions are still at an embryonic stage, websites offering business opportunities in an auction form are not numerous; the only ones we encountered are Bid[10], B2B-Auction[11], and FairMarket[12], this kind of auctions has a strong growth potential.

Among the parties in an auction, there is a nonhuman component that acts like the auctioneer in traditional auctions; it is the web interface or the website hosting the auction. In same cases, the auction website is disassociated from the ownership of the item being auctioned off, as in all C2C and some of B2C or B2B auctions, in other cases the website hosting the

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[7] http://www.haggle.com
[8] We assume as business an agent who purchases on a frequent basis items with the intent to resell them.
[9] http://www.moc.govt.nz/media/auction03.html
[10] http://www.bid.com
[11] http://www.b2b-auction.com
[12] http://www.fairmarket.com

auction owns the items being auctioned off, for example the US branch of Lufthansa[13] or FirstAuction[14] own all the auctioned items.

It is important to know that there are no preset rules regarding who sells to whom and where. The choice of website where to post the auction depends on the potential buyers being targeted and on the item to sell. Regarding the individual consumers who are most likely to place bids over the internet; an attempt to set a profile for them is in section 3.

2.2 Items Sold in Internet Auctions

Internet auctions exist for a wide variety of products such as computers and computer related products, collectibles of all kinds[15], jewelry, or knowledge[16]. Literally any product, service or knowledge is being auctioned off, however by observation the most listed items for sale are computers, software and computer peripherals. We mentioned earlier that the absence of formal rules that separate C2C internet auction from B2C or B2B auctions, however from the nature of the item one could infer the nature of the parties taking part in the auction. For instance if the item to be sold is a used household item, it is most likely that the targeted audience are final consumers. The seller is a consumer if the item is used and one or few units are to be sold, which is the case in many auction website; the seller is a business if the object of the auction is a seat on a flight or refurbished equipment. B2B auctions are easy to spot, if the item to be sold is a bundle of products such as spare parts[17] or is a heavy equipment, it is clear that it targets businesses. Some websites make it clear that they are targeting businesses, by asking the name of the business among other registration information.

[13] http://www.lufthansa-usa.com
[14] http://firstauction.com
[15] http://www.seriouscollector.com
[16] http://www.knexa.com
[17] http://www.fastparts.com

Auctions are being held for single units or multiple units of a given item. We did not encounter any share auction, maybe because of the difficulty to implement such an auction through the internet. In share auction the buyers are required to submit a schedule of quantities they are willing to buy at different price levels, the seller will determine the price that equates demand with supplies, and sells to each what he demanded (Wilson 1979). Although the computation part can be, left to the website, there are still problems on how to submit the schedules and if the seller owns the website what prevents them from leaving an excess demand in order to charge a higher price per unit!

The type of items auctioned off lies between the polar cases of private value and the common value. For private value items the bids are based only on the own valuation of the item, such items are usually bought for ones own use. For items of common value, the bids are based on the bidder's own valuation and some information that the bidder can gather about the item as well, such items are usually meant for resale or for wealth extraction such as mineral rights. In regard to internet auctions, the same classification still applies in the sense that most of C2C or B2C internet auctions are for items whose main reason of purchase is the end-use and all B2B auctions are for items to be resold or used by the purchasing business. This excludes consumers selling items to businesses (unless it is some kind of skill) and consumers purchasing items with common value with the intent of resale, since it is cheaper to buy those items from stores or garage sales. Usually consumers offer for sale items that do not fit their needs anymore, or new items that they cannot return to the seller.

2.3. Internet Auction Rules

Internet auctions introduced new rules and procedures for both buyers and sellers and they can be summarized in three points, registration allowing the use of the website by sellers and buyers,

costs of using the website, and auction institution that determines how the winning bid is selected.

2.3.1. Registration

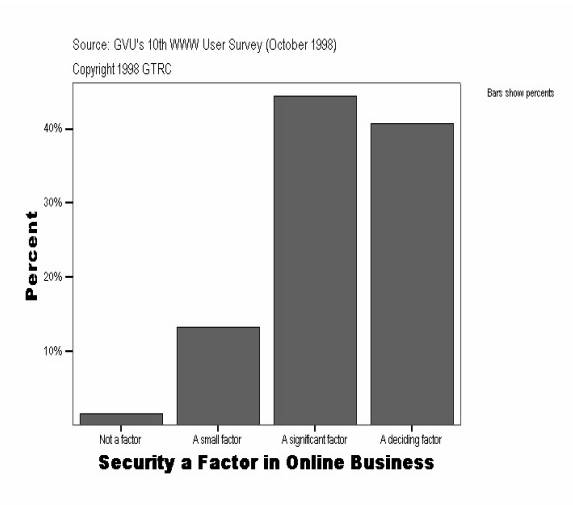
All auction website we visited require a registration for both the seller and the buyer, upon registration the user is given an ID and an access password, the information requested include an e-mail address home/business address, home/business phone number and fax. Some websites such as eBay use the e-mail address to send a confirmation code to be used the first time users access the website. Some other websites like TheSeriousCollector require valid credit card information in order to check the address and to make sure that the user reached the legal age. Some websites like Yahoo[18] do not make any checking, since upon registration the site provides any user with a free e-mail address. However, Yahoo requires any seller to provide credit card information before listing any item.

In order to preserve a safe environment web sites require credit card information. Auction sites such as Up4Sale[19], do not use credit card verification, but make random auditing for phone numbers to check the identity of the users. Another way to secure transactions is the use of escrow services such as I-Escrow[20] who charges the buyer and/or the seller up to 6% of the transaction amount, or TradeSafe[21], who charges the buyer up to 5% of the purchase price and the shipping and handling cost. Escrow services handle in a flawless way the transaction between the buyer and the seller.

Other auction sites use a system of members rating service, where buyers and sellers post appreciations about each other reliability, this system is employed usually for C2C auctions or

[18] http://www.yahoo.com
[19] http://www.up4sale.com
[20] http://www.iescrow.com

B2C auction, other sites like Auctions[22] offer the buyer a protection service in a program called Bid$afe. Indeed security is a major factor among users a survey realized on October 1998[23] by The Graphics, Visualization & Usability (GVU) Center at Georgia Tech revealed that among the 1,482 respondents, 44.4% consider security as a significant factor in online business, and 40.8% consider it as a deciding factor (figure 1). Another concern among internet users seems to be about conducting international business online, the survey revealed that 67.1% are very concerned and 27% are somewhat concerned (figure 2), this can be justified by the high international shipping costs, custom taxes on imports, and difficulty to make claims in case of conflict between buyer and seller.



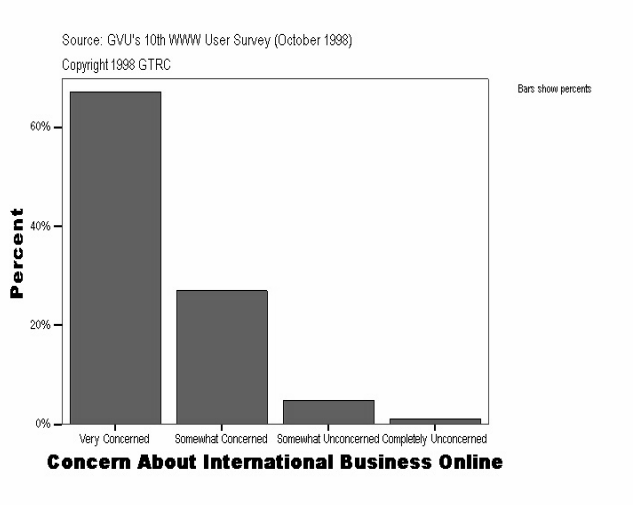


Figure 1: Security a Factor in Online Business **Figure 2: Concern about International Business Online**

2.3.2. Costs of Website Use

Given the number of auctions posted and the value of sales realized on internet auctions sites, one can predict that websites charging fees for the use of their auction service have a good source of revenue. Generally, websites who are selling their own items do not charge any fee to

[21] http://www.tradesafe.com
[22] http://www.auctions.com
[23] http://www.cc.gatech.edu/gvu/user_surveys/survey-1998-10/

bidders, websites who charge fees do that at different levels: registration, listing, feature category, feature showcase, and commission on the wining bid.

Registration fee: Some offline-auction houses charge an entry fee for bidders even if they do not submit any bid. Although we did not encounter any website charging registration fees for internet auction, they might exist especially because of low bandwidth problem or if high affluence of members causes a network congestion or slow-down. If popular, by charging a registration fee the website will keep only the active buyers or sellers and gives them a reason not to switch to another website once the fees are paid.

Listing fee: The Bargain Hut[24] and eBay, charge listing fees based of the reserve price or the starting bid, in some other website the listing fee is function of the memory size of the picture of the item if any, font style used in the heading of the item description and some other enhancements.

Feature category and showcase fee: Auctions.com for example charges fees for listing an item under different categories of products on the web site and charges another fee for listing the item in the showcase, which is a space that is shown every time a user is looking for items similar to the products in the showcase. Items not registered in any category or any showcase are to be found by running a search which minimizes their chances for being seen by visitors and therefore sold.

Commission: Websites who host auctions usually charge a commission on the selling price of every successful auction[25], or if the item is not sold and a reserve price is specified the seller 'buys-it-back'[26] and he is charged a commission on the reserve price. Commissions are usually around 3% of the winning bid or the reserve price if the item is unsold. The fees we

[24] http://www.thebargainhut.com

mentioned may all coexist in a single website, for instance Auctions and TheSeriousCollector, use the combination of many of those fees.

2.3.3. Auction Institutions

Auction Rules: With internet auctions, some auction methods are borrowed from off-line auctions, some are modified, and some others are new introductions. In this subsection, we present the ones we encountered**.**

English Auction: "English Auctions are the most common type of auction probably because of its easy rules and its dynamism. The English format can be used for an auction containing either a single item or multiple items. In an English auction, the price is raised successively until the auction closes. The high bidder(s) at that time are declared the winner(s) and each bidder is required to pay the seller the amount of their winning bid. The bids are sorted in order of price, then time, and then quantity. If bids are for the same price, the earlier bid wins. If bids are made for the same price at the same time, bids for larger quantities win. The sort order only applies when there is a tie."[27] This auction is popular online and off-line because of its dynamism and the competition it creates among bidders.

Dutch Auction: In offline auctions this type of auctions is different from the one online. Offline, in the Dutch auction the seller starts by a price higher than all the bidders' willingness to pay for the object and keeps decreasing that price until one of the bidders accepts that price; this procedure is known also as *mining*. This procedure is used for selling perishable goods such as tulips in Holland.

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[25] http://www.acubid.com
[26] http://www.buffalobid.com
[27] http://auctions.excite.com

Over the internet, the Dutch auction is adequate for selling multiple identical items; the seller announces a starting bid and the number of items available. Every bidder submits a bid, and a quantity, all winning bidders pay the same price, which is the lowest successful bid. This might sound confusing; the example provided by eBay clarifies that:

"A seller has 10 pens for auction at $1 each. 25 people bid $1 for one pen each. In this case, only the earliest 10 bidders will win a pen since the bid amounts are the same and the earlier bids are accepted *before* the 15 later bids. But, say one of those 25 bidders places a bid for higher than $1 - let's say, $2. Since this person's bid is higher than all the others, she will be guaranteed a pen. The earliest bidders who bid $1 will win the other nine pens. The final price for each pen will be $1 (even though someone placed a high bid of $2) since all winning bidders pay the same price - which is the lowest successful bid".

This suggests that if there are less than 10 bidders who know that they value the item more than the remaining bidders do; then they should bid their valuations in order to make sure that each of them gets a pen. However, at the end they each pay the highest or the earliest bid of the remaining bidders, which is less than their valuations. This gives to the auction a taste of Vickrey auction.

Multiunit Auction: This is another method for multiple-item auctions and is used by DealDeal[28], in the auction the highest bid always wins and if there is a tie in the bids, the greater quantity wins over the lesser quantity. If the price and the quantity are ties then the bidder who placed the highest number of bids in the current auction wins and if price, quantity, and number of bid attempts are equal then the buyer who placed the earliest successful bid at the highest

[28] http://www.dealdeal.com

price level wins. Using the described priority rule, a list of winners is posted on the website at the end of the auction and the seller will contact them.

Yankee Auction: OnSale uses this form of auction and it applies when one or more identical items are offered at the same time. Bids are ranked by the highest price, then the highest quantity, and then the time; earlier bids wins over later bids. A variation of the Yankee auction used by OnSale also is the *Express Auction*, which is the same as Yankee Auction, but lasts for only one hour or a day for some merchandise.

Reverse auction: Priceline[29] uses this method, the buyer is required to name a price for some item, that information is transmitted to a network of sellers who will try to match it. Here the information asymmetry is reversed because the seller is a professional and has an informational advantage about the value of the item and in case the buyer overshoots his bid, the seller payoff can be very high. The Economist of July 24th, 1999 reported that the economist Paul Milgrom from Stanford University is "skeptical about its long term prospects", because the buyer ignores the number of the other buyers, has limited information about what is available and he names the price only once. All those reasons make chances of getting a good deal slim.

Double Auction: Double auctions are auction where both parties make continuous offers this can be compared to a great extend to the stock market if the buyer and the seller are known FastParts uses a similar version but the identity of the seller and the buyers is not disclosed, it is called a private double auction.

Length of the auction: Offline English auction and the Japanese auction usually last until all but one bidder opt out; a deadline is reached for the sealed bid auctions, or until one bidder shouts "mine" in the Dutch auction. In general, auctions held at auction houses do not last very long;

[29] http://www.priceline.com

sometimes it is just a matter of few minutes. Internet auction length is variable and can last from few minutes (flash auction, used by FirstAuction) to many days. Same auction websites offer the seller the option to decide on the closing time even if there is still bidding activity. Websites like OnSale or Rails-R-Us[30] make an extension over the preset time until no bidding is being submitted for respectively 5 minutes and 30 minutes, the time extension is called 'Going, Going, Gone' period. The introduction of this feature prevents 'sniping'. Rail-R-Us an online railroad and transportation items auction site defines 'sniping' as follows: "Sniping is the practice of withholding bidding, not starting bidding, or waiting until just before the close time of an auction to place a bid. The idea is to not arouse interest in an item, then bid or outbid just before closing so other potential bidder do not have an opportunity to raise the price."

Variations: Among the variations and the additions to the previous options that we encountered are the minimum bid increments, a starting bid, reserve price, the proxy bid, 'Take-It-Price' auction, and live auction.

The minimum bid increments is set by the seller in some websites and is subject to change during the auction; the variation of the bid increment can accelerate or slow down the bidding. The starting bid informs the buyers about the level from which the bidding should start, it is set beforehand, and made public; it serves to eliminate bidders with very low reservation value. In some auctions the seller can set a reserve price below which the item will not be sold, the reserve price can be disclosed or undisclosed.

When there is no reserve price, the successful bidder who bid above the starting bid wins the item and the seller is in the obligation to accept the bid. However, when there is a reservation price the successful bid is accepted only if it is greater than the reserve price.

[30] http://www.railsrus.com

Disclosure of the reserve price is not advisable because bidders try to bid as close as possible to the reserve price while if the reserve price is not disclosed bidders are more aggressive in bidding, in internet auctions the website forces the seller to accept the successful bid greater than the reserve price, which eliminates cheating.

The proxy bid known also as proxy robot or automatic bidding is used by many websites like Up4Sale, Haggle, and Yahoo. Proxy bids appeared with the internet auctions and it is a system in which bids are placed on behalf of the bidder at the lowest increment each time the bidder is outbid, up to a certain level that is at or below the reservation value of the bidder. Proxy bidding allows bidders to stay active in an auction without necessarily monitoring its progress. It is to note that proxy bidding is not efficient to use in internet Dutch auctions, because one can still win the item without having to outbid the other bidders.

The 'Take-it-Price' auction is used in conjunction with the single item English auction and is used by Amazon[31]. In the 'Take-it-Price' auction, a bidder can seize the item by being the first to offer the 'Take-it-Price' and eliminates the risk of being outbid (Budish and Takeyama 2001). BuffaloBid is using a form of auction called live auction, where "buyers participate in quasi 'real-time' by entering an area much like a 'chat room' where items will be sold. Using forms, buyers continue to place their bids until the auction closes and a winner is announced, or they drop out of the bidding. Each "Live Auction" area will have an open and close time with a pre-determined list of items for sale."[32] The table below without seeking completeness summarizes the main features of internet auction and gives example of websites.

[31] http://www.amazon.com
[32] http://www.buffalobid.com

Table 1: Internet Auctions Summary of Description

Examples	Auction	Length	Business Model	Fees	Other Features
http://auctions.excite.com	English				
http://www.acubid.com				Price commission	
http://www.amazon.com					Take-it-Price
http://www.auctions.com				Category & Showcase	Bid$afe
http://www.b2b-auction.com			B2B		
http://www.buffalobid.com				Buy-it-Back	
http://www.dealdeal.com	Multiunit				
http://www.ebay.com	Dutch			Listing (based on reserve price)	
http://www.fastpatrs.com	Double		B2B		
http://www.firstauction.com		Flash	B2C	None	
http://www.onsale.com	Yankee	Express			
http://www.priceline.com	Reverse				
http://www.railsrus.com		Going, going, gone			
http://www.yahoo.com			C2C		Proxy Bid

3. BIDDERS' PROFILE

In this section, we describe internet users that are likely to participate in an internet auction, it is important to know who is placing bids over the internet for both individual sellers and businesses starting their online auction, that way they know what kind of products to offer. In what follows, we present a description of the dataset and the dual-scaling technique, and then the results.

3.1. Contingency Tables and Dual Scaling

From the GVU WWW 10th survey (October 1998), we retained the answers of 1,482 respondents to the following question: How likely are you to participate in an "online auction" for something you were interested in purchasing?

Their answers are summarized in figure 3 and table 3 (in appendix 1):

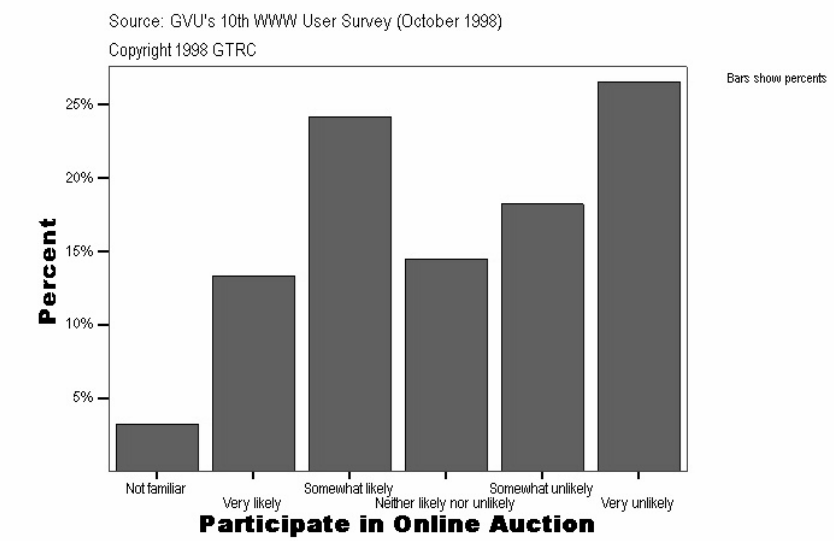

Figure 3: How likely are you to participate in an "online auction"?

Along with the summary data, in appendix 1 we include contingency tables (tables 4, 5, and 6). The contingency tables are for Sex, Online Experience, Skill Level[33], Location, and Age Group. First, we test the association between the likelihood of participating in an online auction and each of these characteristics. Where there is significant association, we use dual scaling to get more information about the association. The test procedure is presented hereafter.

Let f_{ij} be the observed number of people who answered i to the "online auction" participation question and whose other characteristic (sex, experience, skill level, location, or age group) is j. Let $T_{i\bullet} = \sum_j f_{ij}$, $T_{\bullet j} = \sum_i f_{ij}$, and $T = \sum_{i,j} f_{ij}$ be respectively the row totals, column totals, and the total sample size.

Let $E_{ij} = \frac{T_{i\bullet} T_{\bullet j}}{T}$ be the expected number of people who answered i while their characteristic is j. This provides us with a table of expected values and naturally we should have

[33] A rough assessment of skill level based on the number of different activities performed online.

$E_{\bullet j} = \sum_i E_{ij} = T_{\bullet j}$, $E_{i\bullet} = \sum_j E_{ij} = T_{i\bullet}$, and $T = \sum_{i,j} E_{ij}$. The Pearson Chi-square statistic is computed using the following quantity: $\chi^2 = \sum_{ij} \frac{\left(f_{ij} - E_{ij}\right)^2}{E_{ij}}$.

Now we have all the information to test the following Null hypotheses:

H_0: No association between rows and columns of the contingency table.

We reject H_0 if $\sum_{i,j} \frac{\left(f_{ij} - E_{ij}\right)^2}{E_{ij}} > \chi^2_\alpha\left((r-1)(c-1)\right)$, where α, r, c are respectively the significance level, the number of rows and columns and $\chi^2_\alpha\left((r-1)(c-1)\right)$ is the chi-square tabulated value at level α and $\left((r-1)(c-1)\right)$ degrees of freedom.

The result of the test shows that there is association between the likelihood of participating in online auction and each of Online Experience, Skill Level, Location, and Age Group, for Sex the test is not significant a 5%.

Table 2: Association Test

	Pearson Chi-Square		
Characteristic	**Value**	**DF**	**Prob.**
Sex	10.835	5	5.474%
Experience	41.973	10	0.000%
Skill Level	139.146	15	0.000%
Location	32.817	10	0.029%
Age Group	34.020	15	0.338%

The existence of association between the likelihood of participating in an internet auction from one hand and Experience, Skill Level, Location, and Age Group from the other hand, allows for a further study of the relationship described above. The study of the relationship is performed using a data analysis technique called dual scaling, which applies to cases where all the available data is summarized in the form of a contingency table.

The approach of dual-scaling that we look into is called the *analysis of variance*, which if we adopt the following notations (Nishisato 1994), consists in determining columns weight **x** and rows weight **y** in a way that maximizes $\eta^2 = \frac{SS_b}{SS_t}$,

$\mathbf{F} = [\, f_{ij} \,]_{r \times c}$; the contingency table or data matrix.

$\mathbf{f}_r$; the vector of row totals of **F**.

$\mathbf{f}_c$ **;** the vector of columns of **F**.

$\mathbf{D}_r$; the diagonal matrix with row totals in the main diagonal.

$\mathbf{D}_c$; the diagonal matrix with column totals in the main diagonal

y ; a vector of weights for the rows of **F**.

x ; a vector of weights for the columns of **F**.

$f_t = \sum_{i=1,\, j=1}^{r,c} f_{ij}$; the sum of the elements of **F**.

where $SS_b = \mathbf{x}'\mathbf{F}'\mathbf{D}_r^{-1}\mathbf{F}\mathbf{x}$ expresses the variation between the rows and $SS_t = \mathbf{x}'\mathbf{D}_c\mathbf{x}$ expresses the total variation.

One way to maximize $\eta^2 = \frac{SS_b}{SS_t}$, is to set $SS_t = f_t$ and to maximize SS_b. If we set the Lagrangian function of the problem we have:

$$L(\mathbf{x}, \lambda) = \mathbf{x}'\mathbf{F}'\mathbf{D}_r^{-1}\mathbf{F}\mathbf{x} - \lambda(\mathbf{x}'\mathbf{D}_c\mathbf{x} - f_t) \qquad (1)$$

The first-order conditions of the problem are:

$$\frac{\partial L}{\partial \mathbf{x}} = \mathbf{F}'\mathbf{D}_r^{-1}\mathbf{F}\mathbf{x} - \lambda\mathbf{D}_c\mathbf{x} = 0 \qquad (2)$$

$$\frac{\partial L}{\partial \lambda} = \mathbf{x}'\mathbf{D}_c\mathbf{x} - f_t = 0 \tag{3}$$

If we pre-multiply (2) by $\mathbf{x}'$, we get:

$$\lambda = \frac{\mathbf{x}'\mathbf{F}'\mathbf{D}_r^{-1}\mathbf{F}\mathbf{x}}{\mathbf{x}'\mathbf{D}_c\mathbf{x}} = \eta^2 \tag{4}$$

The Lagrangian multiplier is no other than the squared correlation ration, η^2. Equation (2) can be rewritten into:

$$\left(\mathbf{F}'\mathbf{D}_r^{-1}\mathbf{F} - \eta^2\mathbf{D}_c\right)\mathbf{x} = 0 \tag{5}$$

which if pre-multiplied by $\mathbf{D}_c^{-1}$ yields the eigenequation:

$$\left(\mathbf{D}_c^{-1}\mathbf{F}'\mathbf{D}_r^{-1}\mathbf{F} - \eta^2\mathbf{I}\right)\mathbf{x} = 0 \tag{6}$$

The problem now is to find the eigenvalues and the eigenvectors of $\mathbf{S} = \mathbf{D}_c^{-1}\mathbf{F}'\mathbf{D}_r^{-1}\mathbf{F}$. It is to note that in order to avoid the asymmetry of **S,** Nishisato (1994) presented an iterative method to find η^2, $\mathbf{x}$, and $\mathbf{y}$, but the use of any software that handles matrices operation will easily provide all the eigenvalues and the associated eigenvectors of **S**.

Once the trivial solution of $\eta^2 = 1$ is excluded; the eigenvector $\mathbf{x}$, associated with the highest value of η^2 is found from (6), $\mathbf{y}$ can be found using the following dual relationship:

$$\mathbf{y} = \left(\frac{1}{\eta}\right)\mathbf{D}_r^{-1}\mathbf{F}\mathbf{x} \tag{7}$$

At this level, we obtained what is called the first solution with a percentage of total information explained of $\delta_1 = \frac{100\eta_1^2}{\sum_i \lambda_i}$. Nishisato (1994) offers a different formulation for δ_1, but it gives the same result since every eigenvalue explains part of the association and the sum of the non-trivial eigenvalues explains all the association. If the first solution is judged insufficient

to explain the correlation between rows and columns then a second or more solutions can be found by calculating the associated eigenvector **x**, and hence the vector **y**, by taking lower eigenvalues. The number of possible non-trivial solutions is equal to $\min(r-1, c-1)$.

Nishisato (1994) used an iterative method to find the weights **x** and **y**, by taking an arbitrary vector to start the iterative process and when the result converges the process is stopped. However, the use of a non-iterative method but consistent with the theory provides a different result. The differences in results should not matter because the ultimate objective of dual-scaling is to find rows' weights and columns' weights from which an association can be inferred, and that objective is reached using either method since they both provide the same conclusions and captures the same level of information.

3.2. Results and Discussion

The results of the dual scaling can be found in appendix 3 (tables 7, 8, 9, and 10). The purpose of dual scaling is to, as mentioned earlier, infer associations between the likelihood of participating in an internet auction and some other characteristics. Once the weights for the first solution are computed they can be plotted as in figure 4. If we consider internet experience, we can see that the first solution explains over 91% of the association between the likelihood to participate in an online auction and the internet experience. What we need to look for are clusters formed by individuals who answered 'Very Likely' and 'Somewhat Likely' to the survey question. We do not need to look for any clusters around the rest of the answers to the survey question because in this section, the question we are trying to answer is what is the profile of an internet user who is likely to participate in an internet auction? If we use the first solution only (figure 4), one can see that individuals having over 4 years of internet experience are the ones who are most likely to participate in an online auction.

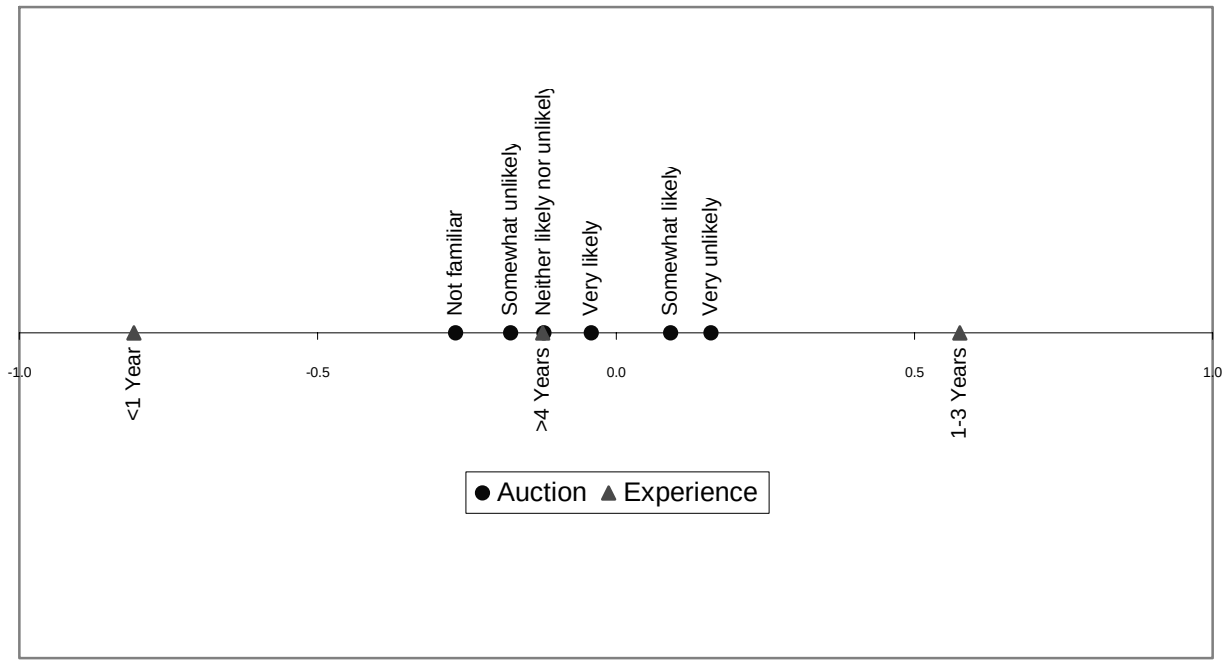

Figure 4: 1st Solution of Auction vs. Experience

In case, the first solution is not enough to explain the association (low η^2) or for a better appraisal of the associations, recourse to a second solution is necessary. We wrote a computer program to find all the solutions (appendix 2). In our case, we limit ourselves to interpret the first and the second solutions as they largely explain the existing associations between the likelihood to participate in an online auction and the other characteristics. The first and the second solution explain 100% of the association between the likelihood to participate in an internet auction and the internet experience of the respondent from one hand and his location from the other hand. The two first solutions explain 97.5% of the association with respect to internet skills and 95% with respect to the age.

If we want to consider both the first and the second solution we need to account for the importance of each solution, which is judged by the magnitude of η^2, hence the introduction of adjusted weights $\left(\mathbf{x}_k^*, \mathbf{y}_k^*\right) = \left(\eta_k \mathbf{x}_k, \eta_k \mathbf{y}_k\right)$ for every solution *k*. Then we can plot $\mathbf{x}_2^*$ against $\mathbf{x}_1^*$ for

the columns (experience, skill, location, or age) and on the same graph plot $\mathbf{y}_2^*$ against $\mathbf{y}_1^*$ for the rows (the survey question). The graphs for the different characteristics are available in appendix 3 (figures 5, 6, 7, and 8). It is important to keep in mind that the use of a second solution may not bring any additional information to the association, but for the sake of completeness, we opted to present it as part of the technique expose.

A closer look at figure 5 shows that the answers 'Very Likely' and 'Somewhat Likely' to the survey question are closer to 'over 4 years' of experience than to any other choice, that is the kind of associations we are looking for. However, this does not exclude people who have 'over 4 years' of internet experience from not participating in an internet auction. The association we found might be explained by the necessity to spend time to understand and to know how to look for information over the internet and then to start relying on the internet for shopping. The fact that the first solution explained 91.16% of the association did not leave room for the second solution to bring any additional information.

Regarding the association between the answer to the survey question and internet skills (figure 6), we could spot out two associations. The first association is between 'Expert' and 'Very Likely' and the second is between 'Experienced' and 'Somewhat Likely'. This might indicate that in order for an internet user to start considering participating in an internet auction, he/she must have already performed certain tasks over the internet, such as registering in some web based services, ordering online, sending e-mail, etc…

Internet users who are most likely to participate in an online auction are located in the United States (figure 7), and that can be attributed to different factors. The vast majorities of internet web sites are located in the US and operate in English. The early development of the internet in the U.S. in comparison with the rest of the world and the ease of access to computers

in general and to the internet in particular made internet users located in the U.S. more familiar and keen on exploring new ways of conducting business. However, that is likely to change in the future as internet use increases in other parts of the world.

Concerning age, the groups of people who are most likely to participate in an online auction belong to the 26-50 age group (figure 8). This is probably because people in that age group have the necessary financial and time resources and may be because they spend more time in front of their computers than other age groups do.

To summarize, the profile of people who are most likely to take part in an online auction is as follows: they are rather familiar with the internet and have some skills using it, are located in the U.S. and are from the age group 26-50. Of course, the results are subject to discussion because of the way the data was collected and because of the fast development and popularity of the internet, if we had a similar data set collected a year later it would have probably gave different patterns of association. The data collection is subject to criticism because it is based on a sample of internet users that is not necessarily representative and who happens to visit certain popular web sites and who have the time and the motivation to fill in correctly the survey form, there is self-selection bias. Although the association patterns we obtained may not be complete, for instance because of the absence of association for age group 21-25 year old, but they certainly do not represent any contradictions with the expectations and the intuition.

4. IMPLICATIONS OF INTERNET AUCTIONS

Internet auctions implication are at more than one level, here we are concerned with the implications regarding economic insights for economists and the changes in economic activities. Regarding the concerns that some economists might have we would like to point out that the investigation of new strategic equivalences between auction institutions or checking the

empirical validity of the ones that already exist within the corpus of auction theory, is just the apparent tip of the iceberg. At the theoretical level, what economists should be concerned with are the bidding strategies. Internet auctions introduced new rules and choices; naturally, one should expect a change in the bidding strategies of buyers in general and a change in sellers' choices regarding the auction method and other variation that can be used with it. It is known that in auctions the informational asymmetry is to the advantage of the buyer and that in a car purchase transaction for example the informational asymmetry is to the advantage of the seller. What happens if a car is being auctioned off over the internet? There are two different types of adverse selection one to the advantage of the seller and the other to the advantage of the buyer. How that will affect the bidder's behavior? Which of those asymmetries will affect most the wining bid?

In internet auctions, even if a seller provides a full description of an item, there is nothing in it that says why the item is being sold. It could be a camera that is sold because it has an abnormal consumption of batteries, or because the seller found somewhere else a better camera within the same range of price, or may be because the camera has been over used in a short period and the way it looks does not indicate anything about that.

Another theoretical point worth investigating is the optimal fee structure that auction web sites charge to the sellers and buyers and whether the existing fee structures induce inefficiencies or counter incentives to bidders, and if sellers have incentive to post for auction items that have chances to be sold or not. If the actual fee and commission structure allow sellers to post items with low probability of being sold then those fees and commissions should be revised because it is more beneficial for an auction site to have a page full of successful items than with unsuccessful ones. The lack of sales will affect the quality and the number of visitors of the site

and hence its revenues in general (fees and advertisements). Indeed, "This difference in fees has an important effect on sellers' incentives and behavior. Because Yahoo! does not charge fees for auction listings, a seller has less incentive to make sure that her auction results in an actual transaction. Indeed, a quick check reveals that most Yahoo! auctions have very high reserve prices, with the sellers apparently hoping for a 'sucker' to come along and be willing to pay their high price. By contrast, at eBay and Amazon, sellers know that they will incur a listing fee whether the item sells or not, so they have an incentive to set reasonably low reserve prices to create a higher probability of resulting in a transaction" (Lucking-Reiley 2000).

At the empirical level economists should look into the allocative efficiency of internet auctions, in the past when households had items that they do not need anymore they either sell them in a garage sale, donate them, or they end-up in the dumpster. It was not possible to organize auctions for many items because of the high cost of organizing such an auction compared to the expected earnings; the earnings can be low because of the intrinsic value of the item and because of the lack of bidders at the local level. It will be interesting to evaluate the amount of wealth generated from items that had no resale value before the internet auction and that are now being exchanged through C2C auctions.

At a more practical level internet, auctions can be more efficient and collusion proof than offline auction. In the case of B2B auction, the use of the internet can reduce the collusion among bidders and increase their participation in number. With offline auctions, it happens that businesses collude and use side payments inside and outside the company in order to win an item or a contract. If the auction is not largely diffused, few bidders will submit bids and some bidders might win because of the lack of bidders or existing bidders will collude in order to keep the winning bid low. With the use of the internet, it is easy and almost costless to make the

auction public either through its publication on a web page or through mass e-mail distribution with undisclosed list of recipients. The fact that there is larger number of bidders whose identity is undisclosed makes it less likely for collusions to form and makes bidding more aggressive.

Internet auctions invaded grounds that used to belong to auction houses, the fact that bidders do not have to be physically present during the auction increased the number of bidders in many auctions, which made sellers more keen to list their items on the internet rather than using the auction house services. Since, thousand or rather millions of items are being listed, the websites were able to lower their fees and commissions compared to what auction houses charge and still attract many sellers and buyers to their auctions. Although, popular internet auctions do not have the required expertise and staff to authenticate valuable items such as paintings and diamonds, in order to enhance their respective efficiencies and earnings, some internet websites and auction houses joined forces. Amazon and Sotheby's Holdings, Inc. announced a venture of $45 million to create a joint auction website (Ginty, 1999b). This venture will allow art and antique dealers to market their goods to Amazon's customers. Another operation of large scale is the acquisition of the auction house Butterfield & Butterfield by eBay for about $260 million; the acquisition will allow eBay to enter the European and the Asian markets trough the auction house rich network (Ginty 1999a; Masterson 1999). The question is to what extent auction houses and auction websites will merge, are we going to witness the disappearance of centuries old auction houses behind the success of internet websites and will that ultimately trigger a merger among popular auction websites? What are the gains or losses to the buyers and sellers?

One last point that needs investigation is the following; internet auction offer the facility to be always an active bidder using proxy bids. But, if the auction website owns the items being auctioned what prevents the seller from introducing a fictitious bidder with a bid just a little less

that the highest proxy bid limit and then outbid the fictitious bidder by the bidder with the highest proxy bid limit and making him pay the highest he is willing to bid. For example: let A and B be two bidders using proxy bids with limits of $100 and $75 respectively, if the minimum bid increment is $5, what prevents the website from introducing a fictitious bidder C with a bid of $95 and than outbid it with a $100 bid from A? This last point suggests the study of compatibility among internet auction methods and other feature from the seller and the buyer point of view.

4. CONCLUSION

The recent development of the internet and its popularity among users made the growth of e-commerce businesses and online auction websites relatively easy considering that five years ago many of them where nonexistent. E-commerce and online auctions seem to be competing for the same group of consumers and many identical items seem to be available in both of them. In this paper, we present a description of the principal features of internet auctions, then we set up a profile for an online auction bidder, and we found that bidders are most likely located in the U.S., have some internet experience and skills and that they belong to the 26-50 age group. We also look into the implications of the development of online auction, those implication touch both research in economic theory and economic activity. The new environment introduced by online auctions requires investigation at the consumer behavior level and the firm level, especially if we consider the mergers that are happening now and the multitude of auction methods and techniques that risk blurring buyers understanding of the rules of each method. At the informational level, it looks that the buyer is more worried than the seller about adverse selection issues. The buyer is more concerned about quality issues that the seller is concerned about extracting the highest price for the item. We feel it should not be the case because buyers'

valuation should take into account the information withheld by the seller, the valuation in turn affects the bidding behavior, which will affect the seller's payoff. Of course, this is pure speculation that needs to be looked into in more details.

The use of internet auctions will certainly affect the efficiency of the price system as a whole, but might also create inefficient behavior if bidders do not devote enough time to collect information about the item being auctioned and the listed price for it. It is common to find bids above the store price of an item, or bidding a little less than the store price for a second hand item. Does the difference in prices cover the search costs or is it just an expression of irrational behavior?

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APPENDIX 1: Data Description

Table 3: How likely are you to participate in an "online auction"?

	Frequency	Percent	Cumulative Percent
Not familiar	48	3.2	3.2
Very likely	198	13.4	16.6
Somewhat likely	358	24.2	40.8
Neither likely nor unlikely	215	14.5	55.3
Somewhat unlikely	270	18.2	73.5
Very unlikely	393	26.5	100
Total	1482	100	-

Table 4: Contingency tables for Experience and Skill Level

	Experience				*Skill Level*				
	<1 Yr.	**1-3 Yrs**	**>4 Yrs**	**Total**	**Novice**	**Intermediate**	**Experienced**	**Expert**	**Total**
Not familiar	11	16	19	**46**	20	13	9	4	**46**
Very likely	15	47	133	**195**	9	38	76	72	**195**
Somewhat likely	31	99	219	**349**	28	88	148	85	**349**
Neither likely nor unlikely	36	67	112	**215**	30	57	89	39	**215**
Somewhat unlikely	40	75	151	**266**	34	76	109	47	**266**
Very unlikely	61	142	184	**387**	79	140	125	43	**387**
Total	**194**	**446**	**818**	**1458**	**200**	**412**	**556**	**290**	**1458**

Table 5: Contingency tables for Location and Age Group

	Location				*Age Group*				
	USA	**Europe**	**Other**	**Total**	**11-20**	**21-25**	**26-50**	**50+**	**Total**
Not familiar	30	9	7	**46**	4	5	31	6	**46**
Very likely	184	7	4	**195**	6	26	123	38	**193**
Somewhat likely	294	29	26	**349**	24	51	213	53	**341**
Neither likely nor unlikely	177	23	15	**215**	10	27	140	31	**208**
Somewhat unlikely	218	29	19	**266**	15	40	166	41	**262**
Very unlikely	320	31	36	**387**	20	34	222	104	**380**
Total	**1223**	**128**	**107**	**1458**	**79**	**183**	**895**	**273**	**1430**

Table 6: Contingency table for Sex

	Sex		
	Female	**Male**	**Total**
Not familiar	20	26	**46**
Very likely	55	140	**195**
Somewhat likely	101	248	**349**
Neither likely nor unlikely	64	151	**215**
Somewhat unlikely	76	190	**266**
Very unlikely	141	246	**387**
Total	**457**	**1001**	**1458**

APPENDIX 2: Computer Program

```
%Internet Auction: Description, Bidders' Profile and Implications.
%
%By:
%Chokri Dridi.
%University of Illinois, Urbana-Champaign, USA.
%
%This program determines the row and columns weights of a contingency table
%and provides all the solutions. (the number of solutions that fully explain
%the data is min(#rows-1,#columns-1)
%
%Based on:
%Shizuhiko Nishisato (1994):
%"Elements of Dual Scaling: An Introduction to Practical Data Analysis"
%Lawrence Erlbaum Associates, New Jersey.
%
%This program is written for MATLAB 5 by Chokri Dridi, Spring 2000.
%warning: the code is case sensitive.

clc
clear all
%format rat

%The data matrix is an ASCII space separated file.
load c:\windows\desktop\age.txt -ascii

%F should be assigned the name of the file
F=age;

[r,c]=size(F);
fc=sum(F);
fr=sum(F');
ft=sum(fc);
Dr=diag(fr);
Dc=diag(fc);

%The eigenvalues are obtained from (S-lambda*I)x=0
S=inv(Dc)*F'*inv(Dr)*F;

%Stores the eigen values in a vector lambda, the first value is a trivial
%solution it is 1 (highest value)
lambda=eig(S);

%Gets the eigen vector (V) and the eigen values
[V,tmp]=eig(S,'nobalance');

%Since all the eigen values must be positive we can set the highest value (1) to zero
[tmp,i]=max(lambda);
lambda(i)=0;
clear tmp,i;

%Sorts the vector lambda (ascending) and stores the initial ranking in p
[U,p]=sort(lambda);
```

```
%Gets the position of the highest eigen value and its position in lambda
%and stores in id
[tmp,id]=max(U);

for i=1:min(c-1,r-1)

  disp('Solution #')
  disp(i)

  disp('The squared correlation ratio (eigen value) is:')
  disp(lambda(p(id-(i-1))));


  disp('The Columns Weights are:')
  x=V(:,p(id-(i-1)));
  disp(x)

  disp('The Adjusted Columns Weights are:')
  disp(sqrt(lambda(p(id-(i-1))))*x)

  disp('The Rows Weights are:');
  y=inv(Dr)*F*x/sqrt(lambda(p(id-(i-1))));
  disp(y);

  disp('The Adjusted Rows Weights are:')
  disp(sqrt(lambda(p(id-(i-1))))*y)

  %Percentage of total information explained
  sigma=100*lambda(p(id-(i-1)))/sum(lambda);
  disp('sigma =');
  disp(sigma);

end
```

Appendix 3: Results

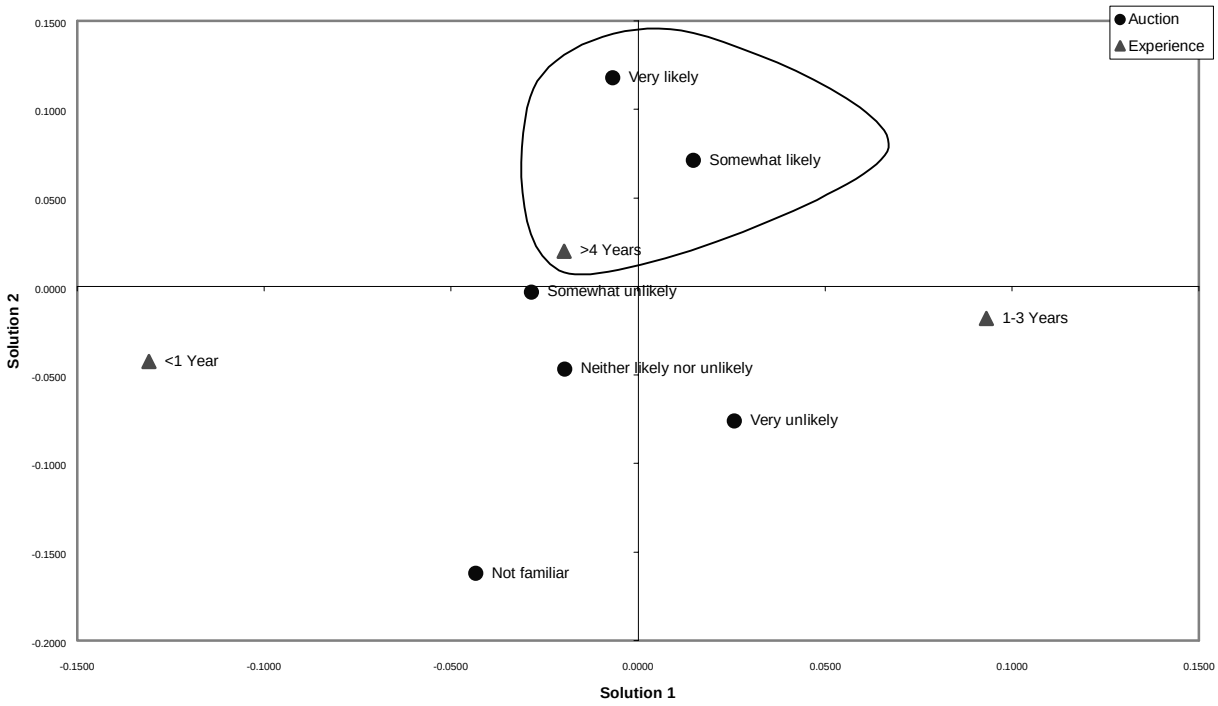

Figure 5: 1st Solution vs. 2nd Solution of the Association between Online Auction and Online Experience

Table 7: 1st and 2nd Solutions of the Association between Online Auction and Online Experience

1st Solution	*Weight*	*Adj. Weight*	*2nd Solution*	*Weight*	*Adj. Weight*
Not familiar	-0.2685	-0.0435	**Not familiar**	-3.2404	-0.1620
Very likely	-0.0418	-0.0068	**Very likely**	2.3562	0.1178
Somewhat likely	0.0915	0.0148	**Somewhat likely**	1.4226	0.0711
Neither likely nor unlikely	-0.1209	-0.0196	**Neither likely nor unlikely**	-0.9322	-0.0466
Somewhat unlikely	-0.1765	-0.0286	**Somewhat unlikely**	-0.0664	-0.0033
Very unlikely	0.1590	0.0257	**Very unlikely**	-1.5215	-0.0761
<1 Year	-0.8083	-0.1308	**<1 Year**	-0.844	-0.0422
1-3 Years	0.5759	0.0932	**1-3 Years**	-0.3608	-0.0180
>4 Years	-0.1223	-0.0198	**>4 Years**	0.3969	0.0198
Nu-2	0.0262		**Nu-2**	0.0025	
Sigma	91.1683		**Sigma**	8.8317	
Sigma Total	100				

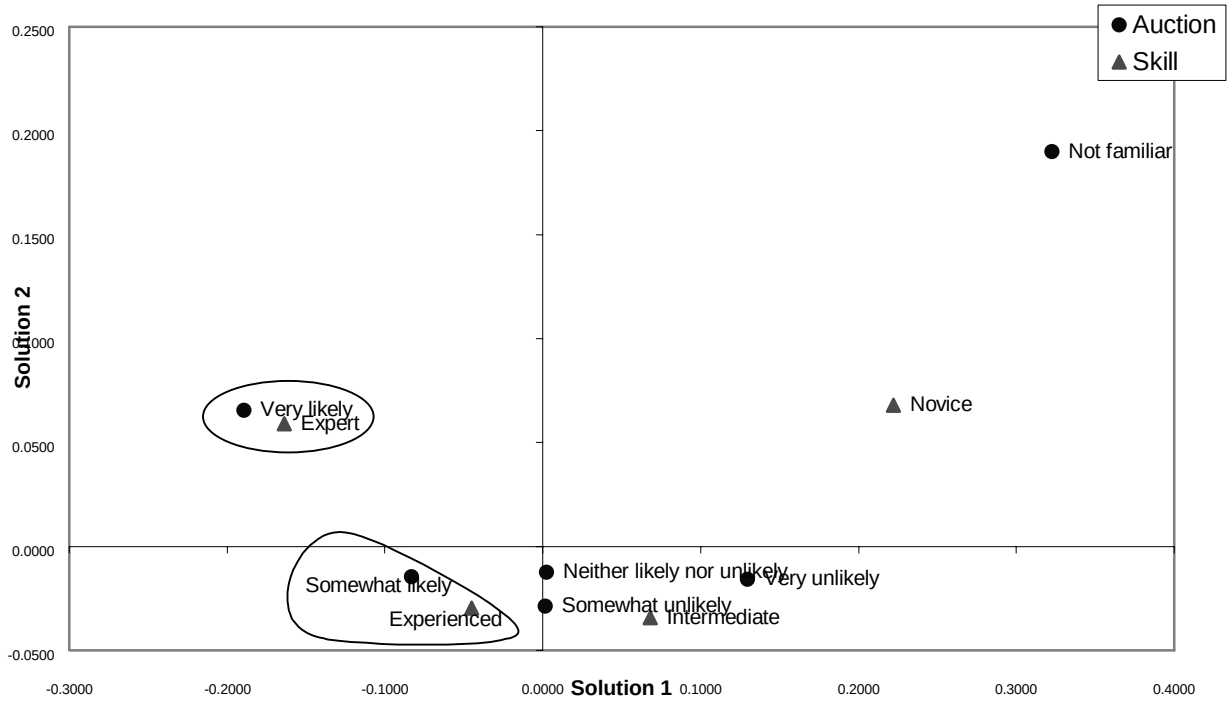

Figure 6: 1st Solution vs. 2nd Solution of the Association between Online Auction and Online Skills

Table 8: 1st and 2nd Solutions of the Association between Online Auction and Online Skills

1st Solution	*Weight*	*Adj. Weight*	*2nd Solution*	*Weight*	*Adj. Weight*
Not familiar	1.1205	0.3224	**Not familiar**	1.8802	0.1899
Very likely	-0.6577	-0.1893	**Very likely**	0.6493	0.0656
Somewhat likely	-0.2893	-0.0832	**Somewhat likely**	-0.1438	-0.0145
Neither likely nor unlikely	0.0089	0.0026	**Neither likely nor unlikely**	-0.1219	-0.0123
Somewhat unlikely	0.0060	0.0017	**Somewhat unlikely**	-0.2845	-0.0287
Very unlikely	0.4501	0.1295	**Very unlikely**	-0.1577	-0.0159
Novice	0.7718	0.2221	**Novice**	0.6744	0.0681
Intermediate	0.2369	0.0682	**Intermediate**	-0.3407	-0.0344
Experienced	-0.1564	-0.0450	**Experienced**	-0.2952	-0.0298
Expert	-0.5690	-0.1637	**Expert**	0.5848	0.0591
Nu-2	0.0828		**Nu-2**	0.0102	
Sigma	86.7616		**Sigma**	10.7041	
Sigma Total	97.4657				

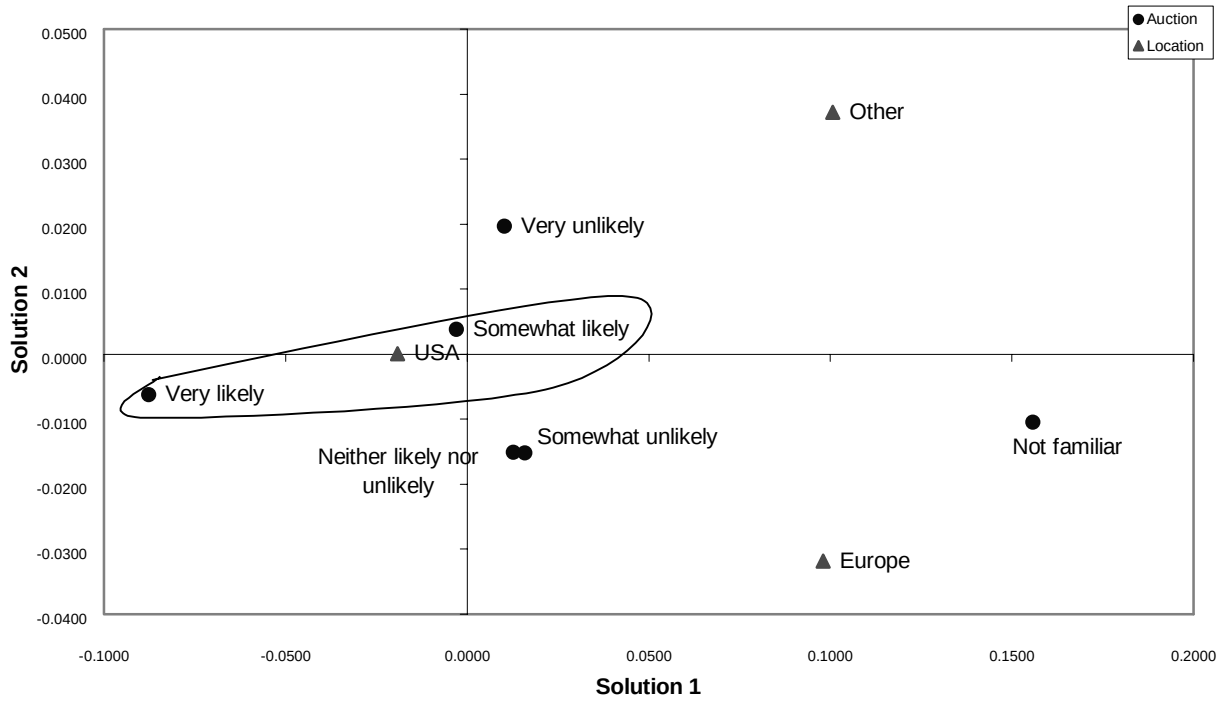

Figure 7: 1st Solution vs. 2nd Solution of the Association between Online Auction and Location

Table 9: 1st and 2nd Solutions of the Association between Online Auction and Location

1st Solution	*Weight*	*Adj. Weight*	*2nd Solution*	*Weight*	*Adj. Weight*
Not familiar	1.0985	0.1557	**Not familiar**	-0.2130	-0.0104
Very likely	-0.6178	-0.0876	**Very likely**	-0.1269	-0.0062
Somewhat likely	-0.0208	-0.0029	**Somewhat likely**	0.0789	0.0039
Neither likely nor unlikely	0.0902	0.0128	**Neither likely nor unlikely**	-0.3081	-0.0151
Somewhat unlikely	0.1120	0.0159	**Somewhat unlikely**	-0.3096	-0.0152
Very unlikely	0.0723	0.0103	**Very unlikely**	0.4021	0.0197
USA	-0.1345	-0.0191	**USA**	0.0016	0.0001
Europe	0.6910	0.0980	**Europe**	-0.6501	-0.0318
Other	0.7103	0.1007	**Other**	0.7599	0.0372
Nu-2	0.0201		**Nu-2**	0.0024	
Sigma	89.1194		**Sigma**	10.8806	
Sigma Total	100				

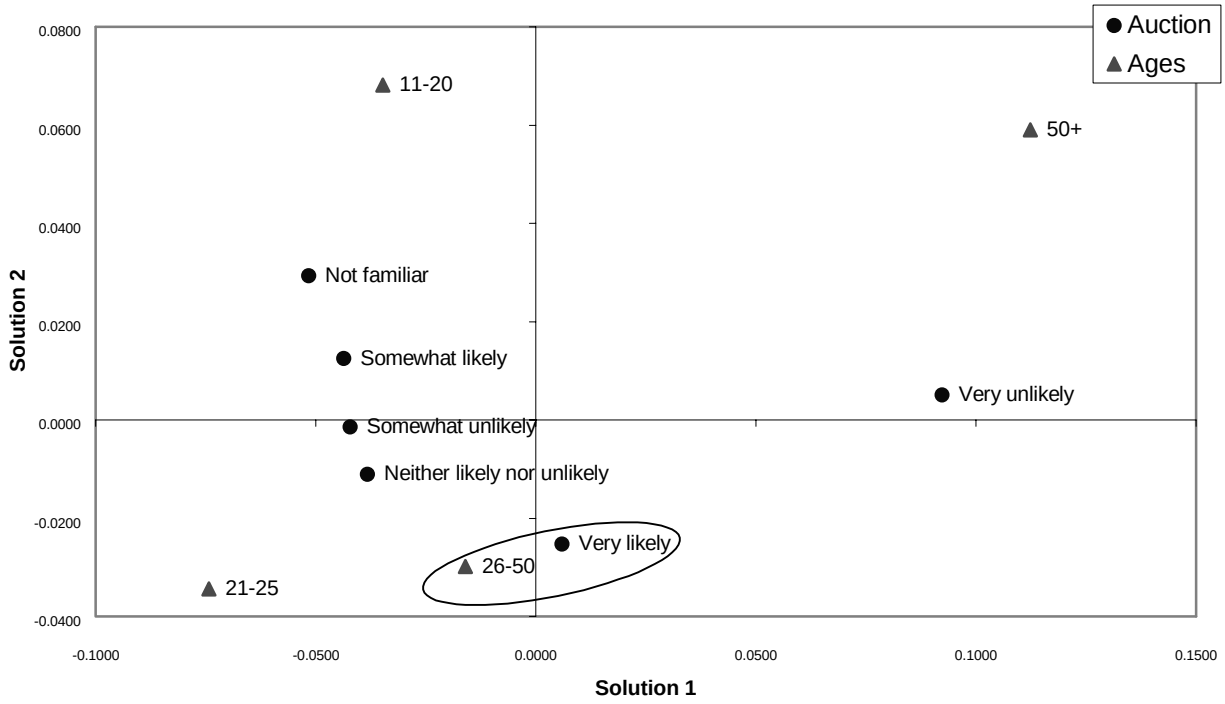

Figure 8: 1st Solution vs. 2nd Solution of the Association between Online Auction and Age Group

Table 10: 1st and 2nd Solutions of the Association between Online Auction and Age Group

1st Solution	*Weight*	*Adj. Weight*	*2nd Solution*	*Weight*	*Adj. Weight*
Not familiar	-0.3689	-0.0516	**Not familiar**	0.5346	0.0293
Very likely	0.0422	0.0059	**Very likely**	-0.4623	-0.0253
Somewhat likely	-0.3111	-0.0436	**Somewhat likely**	0.2280	0.0125
Neither likely nor unlikely	-0.2727	-0.0382	**Neither likely nor unlikely**	-0.2018	-0.0111
Somewhat unlikely	-0.3008	-0.0421	**Somewhat unlikely**	-0.0261	-0.0014
Very unlikely	0.6590	0.0923	**Very unlikely**	0.0939	0.0051
11-20	-0.2484	-0.0348	**11-20**	0.9923	0.0544
21-25	-0.5309	-0.0743	**21-25**	-0.1012	-0.0055
26-50	-0.1142	-0.0160	**26-50**	-0.0703	-0.0039
50+	0.8022	0.1123	**50+**	0.0112	0.0006
Nu-2	0.0196		**Nu-2**	0.0030	
Sigma	82.3633		**Sigma**	12.6817	
Sigma Total	95.0450				