

# Reverse Procurement and Auctions for Consumers

## A New Trend on the Horizon of E-Commerce?

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Considering the fact that current online auction formats bear pitfalls for consumers the question must be raised whether there is not room for alternative formats and platforms which are more advantageous to consumers. Procurement formats which are currently gaining in relevance are reverse auction schemes. Platforms such as jobdoo or LetsWorkIt analysed in this paper enjoy rapid growth and are both able to attract more than 15.000 users after approximately one year of operation. In these “reverse” schemes buyers are in the driver’s seat: They formulate their needs and then make sellers compete to serve these. The winner is the supplier who places the lowest bid; a procedure that leads to considerable consumer surplus as this paper shows.

Scientific literature on B-2-C auctions ignores this trend. Instead, it focuses almost exclusively on seller initiated auctions as well as on supply side benefits. Customer benefits are widely neglected [Möll04,

360 and 363] as a 2004 synthesis of scientific literature shows [GeCK04]. Only four empirical studies have focused on consumer issues of electronic B-2-C auctions, and out of these, three used data from eBay’s forward auctions.

Our paper intends to address this gap. We do so by comparing over 2500 reverse procurement processes that took place on two competing platforms, namely a reverse auction and a bid invitation. We start out by giving a brief overview of reverse procurement formats and their treatment in the scientific literature (section 2) followed by an elaboration of our research hypotheses (section 3). Assuming forward and reverse auctions to be symmetric, we hypothesize that consumer surplus in the two platforms investigated is driven by the same factors observed in the literature for forward auctions, namely bidding intensity, auction duration and starting price. Our data suggests, however, that while bid-

### ■ 1 Introduction

Internet auctions have become very important for B-2-C E-Commerce. With 56 million active users, eBay alone generates € 34 billion in turnover per annum [Ebay05, 2]. Typically, forward auctions with an ascending-bid mechanism are employed in B-2-C or C-2-C environments. Sellers initiate auctions and buyers compete for the products offered which causes prices to rise until the highest bid wins. With a similar auction design, eBay (holding over 80% market share of all online retail auctions [Wood04, 2]) is “seller-oriented”: It is the seller who initiates the process, and it is equally the seller who is then favoured by inexperienced buyers who often overbid and overpay their target items; a phenomenon called “the winner’s curse” [see e.g. MeLe99, 466; Roth95, 60–65; ChLe05, 1; KaLe86].

### Executive Summary

Web-based bid invitation platforms and reverse auctions are increasingly used by consumers for the procurement of goods and services. An empirical examination shows that with B-2-C these procurement methods generate considerable benefits for the consumer:

- Reverse auctions and bid invitation platforms generate high consumer surplus in the procurement of general and crafts services.
- The level of this consumer surplus is affected by the number of bidders. The duration of the auction and the starting price are less important.
- In the painting business prices are considerably lower than with traditional procurement channels.
- On bid invitation platforms, in most cases (> 55%) the bids with the lowest price are chosen.

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ding intensity is a strong determinant of the resulting market price, an auction's starting price and duration do not seem to have an impact on consumer surplus in the reverse format (section 5). Furthermore, we investigate how reverse procurement platforms can stimulate bidding intensity (sections 4 and 5). Here, our analysis suggests that such platforms should be carefully designed to imply minimal participation barriers for suppliers.

## ■ 2 Reverse Procurement Formats

The development of reverse auction platforms has originally been driven by the desire of big companies from the automotive sector to streamline their procurement processes and to increase competition among suppliers. In February 2000, Daimler-Chrysler, Ford and General Motors announced the development of a common procurement platform, called "Covisint" (now operated by a subsidiary of Ariba). The project was soon joined by other car-makers such as Renault, Nissan and Peugeot Citroën. In other industries like electronics, consumer goods, aerospace and services such reverse auctions have become important as well [Kauf03, 200]. According to Kaufmann and Carter [KauC03], between 35% and 50% of major companies with a purchasing volume over 100 Mio US-\$ p.a. use procurement auctions by now and sales volumes are predicted to grow between 10 and 15% annually.

Reverse auctions are auctions where the traditional roles of bidder and initiator are "reversed". This means that "sellers bid instead of the buyers" [Jap01, 1]. In reverse auctions, it is the buyer who initiates the negotiation process by specifying and announcing his needs. This definition does not comprise reverse pricing mechanisms (a view also supported by [BeSS05]. Please note, however, that some other authors view this differently, such as [DEHS05, 352]). Reverse auctions can take different forms [Kauf03, 202] depending on the direction prices take. A frequently used alternative is the first-price English reverse auction. Here, buyers state a maximum price they are willing to pay for a good or service. Suppliers can then submit decreasing bids for the contract. The supplier who places the lowest bid wins the auction and has to deliver at this lowest bid price level. Many B-2-C reverse auctions (including

the one under analysis here) use a setting where the auction terminates after a given time – which is a modification of the traditional English auction setting.

Reverse auctions have been widely used in B-2-B and B-2-G for several years now, and sophisticated bidding procedures have evolved for such bidding platforms. Businesses typically use multiple criteria to evaluate suppliers. These include price, quality and reliability of service, date of delivery, probability of bankruptcy, competency, fairness and reputation [LaTi93, 560; BBKV04]. In addition to multidimensionality, B-2-B auctions may also include multiple buyers and sellers, or the quantities of goods and services to be procured in the auction may be variable [DaSp90]. However, reverse auctions which target consumers do not implement any of these sophisticated procedures so far. Instead, they offer a simple auction model with only one buyer and a predefined contractual scope. Price is the only selection criterion, which can be risky for buyers as they may have to award the contract to a supplier not meeting other desired qualities.

Given the fact that the auctions under consideration in this paper allow for one buyer only, the procurement situation can be considered as a monopsony, which can be regarded as "essentially the same as [a] monopoly apart from reversal of signs of some variables" [McMc87, 701]. As a result, findings on classical forward auction theory should be transferable to the reverse settings under analysis here. Taking the reversal of signs into consideration, the following auction properties can thus be expected:

- An increase in the number of bidders will lead to a decrease in reverse auction price – an effect which should be observable both in private value auctions [McMc87, 711] and in common value auctions. As a consequence, buyers should try to intensify competition at their auctions (such as by selecting longer auction durations).
- When setting up the auction, rational buyers will state a reserve price below their own valuation of the contract [McMc87, 713]. However, the selected reserve price will not diverge too much from this valuation because lowering the reserve increases the risk of auction failure, thus implying a trade-off for the buyer.

An interesting question to be discussed in the B-2-C context is the role which a reserve price might play. Many of the consumers using the procurement platforms will

be quite inexperienced and may not have any information about the true value of their contract. In this respect, B-2-C procurement differs significantly from B-2-B procurement where highly experienced buyers have a detailed overview of the market in which they operate.

Contrary to common B-2-C auction mechanisms where the winner is chosen automatically on price, bid invitation platforms offer far more flexibility to buyers. Even though they initially follow a reverse auction format they do not oblige the buyer to commit to the cheapest seller upfront. Additionally, electronic bid invitations put buyers in a better position towards sellers than in offline markets, because information asymmetries on price are reduced. One goal of this paper is to analyse user behaviour on bid invitation platforms and to find out whether procurement results differ from the ones achieved in a comparable reverse auction setting.

## ■ 3 Research Questions and Hypotheses

B-2-C auctions have generally gained in popularity. But is it feasible that *reverse* formats can establish themselves as a serious competitor to forward auctioneers such as eBay? Even though B-2-B markets have seen this market model emerge, supply processes in the B-2-C area are not established for this type of selling process (yet). Craftsmen typically do not go online to see whether some private person has posted a service request and retailers don't do the same to sell off their products.

Therefore, we are interested in whether reverse auction platforms existing to date in the B-2-C area are at all successful. We wanted to know whether they can bring together buyers and suitable suppliers, thus stimulating competition. In addition, we wanted to investigate the consequences of this market model for consumers, particularly with respect to price level satisfaction. Price level satisfaction may be determined by both subjective and objective elements. From an objective perspective, reverse procurement platforms are useful if they are able to beat traditional offline market prices as well as prices from alternative online channels. Therefore, we ask whether reverse procurement schemes lead to prices below traditional offline procurement channels.

In addition to this price comparison in absolute terms, subjective perception of prices may also play a role for consumer satisfaction. A consumer may not always have full information about market reference prices, but he still has an idea of what he is intuitively willing to pay for a service. If the auction price is less than this willingness to pay, the process generates a consumer surplus. Therefore, another research question is whether and to what extent reverse procurement mechanisms are able to generate such a surplus.

Very few studies have looked into the effect of auctions on consumer benefits in B-2-C or C-2-C settings. One by Brynjolfsson et al. [BrHS03, 1593] claims that an important benefit for the consumer is created by the fact that goods become more readily available. A second study by Bapna, Jank and Shmueli [BaJS04] analysed consumer surplus effects in eBay auctions. Defining consumer surplus as the difference between a consumer's willingness to pay and the price he actually has to pay [BaJS04, 5], the authors used data from more than 5000 auctions to investigate the influence of number of bidders, seller reputation and auction duration on the surplus. In this study, willingness to pay (WTP) was determined with the help of a bidding agent, which registered the users' WTP and in the meantime prevented that this information became public knowledge before the end of the auction. The authors found that a high number of bidders (indicating strong competition) leads to lower consumer surpluses, that auction duration has a negative impact on the surplus [see also LBPR05, 16] and that a good seller reputation influences the surplus negatively. Furthermore, Bajari and Hortacsu [BaHo03, 336] report that low minimum bids tend to increase final auction prices, but only if competitive bidding takes place.

Starting out from these insights on traditional forward auction formats, the current paper investigates reverse, buyer-oriented procurement mechanisms asking whether the effects which previously were advantageous for the supplier now start working in favour of the consumer.

In traditional B-2-C auction formats, the number of bids and/or the number of bidders typically are an indicator for the intensity of competition. Bidding intensity is an important factor for price determination and therefore for consumer surplus. This phenomenon has been analysed in numerous empirical studies [e.g. DeHs04, BaHo03] and has been confirmed with very high probability. For private value

English auctions, the influence of number of bidders on price follows directly from theoretical considerations. As a result, the winning bidder approximately pays "the maximum of the reservation values of the other . . . buyers" [RiSa81, 382]. The more bidders there are, the higher is this second highest reservation value [McMc87, 711] and thus the benefit of the seller. Originally, it was assumed that this effect did not apply to common value auctions, because bidders were believed to adapt their reservation price as soon as the number of other bidders and their behaviour become observable. However, bidders persistently fail to account for this additional information while bidding [FoMu96], particularly in auctions with larger numbers of participants [KaLe86], thus leading to the winner's curse. On this background we equally hypothesize for reverse procurement schemes:

H1: *Reverse procurement auctions see a positive correlation between relative consumer surplus and the number of bidders.*

Another factor which may have an impact on consumer surplus is auction duration. Existing studies deliver mixed results on the influence of auction length on price. Lucking-Reiley et al. [LBPR05, 16] confirmed a statistically significant positive correlation whereas Melnik and Alm [MeAl02, 346–347] found that auction duration had very little and insignificant influence. Due to this ongoing controversy, a second research hypothesis dealing with auction length is formulated:

H2: *Reverse procurement auctions see a positive correlation between relative consumer surplus and auction duration.*

Research dealing with the effect of starting prices in eBay-type auctions has shown that the level of the starting price can influence auction price (for an overview, see [PiSV03, 1468]). As far as reverse auctions are concerned, it can be argued that a high starting price indicates high potential turnover, thus making participation in the procurement process attractive for suppliers. In addition, large-volume contracts may be necessary for the supplier to achieve a satisfactory utilisation – thus making bidding interesting. Therefore, the third research hypothesis reads as follows:

H3: *Reverse procurement auctions see a positive correlation between relative consumer surplus and auction's starting prices.*

Finally, considering the different mechanisms of reverse procurement discussed above one could argue that reverse auction formats may be more efficient in maximising consumer surplus than bid invitation

platforms that leave buyers with more freedom of choice. This is because in purely price based auctions suppliers are chosen exclusively on the basis of their monetary ability to compete. If suppliers want to win a contract they therefore have an incentive to subsequently lower their offers and by this increase consumer surplus. On this background we formulate research hypothesis 4:

H4: *Reverse auctions are more effective in maximising consumer surplus than this is the case for bid invitation platforms.*

In section 5, we will analyse large sets of empirical data from the bid invitation platform jobdoo and the reverse auction LetsWorkIt in order to answer the research questions and to test the hypotheses presented above. Before doing so, section 4 provides a detailed description of the two procurement sites, as well as some information on data acquisition.

## 4 Method

### 4.1 Description of Auction Sites

In order to gain an insight into the research questions and hypotheses outlined in section 3, we analysed and compared two strongly growing procurement platforms: a reverse auction platform, <http://www.letsworkit.de>, and a bid invitation platform, <http://www.jobdoo.de>. Both platforms mainly address the B-2-C sector. The reverse auction platform LetsWorkIt focuses on the auctioning of services and crafts. It started its auction service in June 2004 and has since attracted more than 16.100 registered users. Around 1.500 users are added to this number each month. Similar to LetsWorkIt, jobdoo also offers crafts services and it was launched in July 2004. Currently jobdoo has around 19.000 registered users to which around 2.000 newcomers are added every month. The growth numbers on both platforms indicate a vivid consumer interest in the platforms' services. Contractual terms for sellers and buyers on these two platforms are, however, differing. As these differences may have an influence on site frequentation and bidding behaviour as well as consumer surplus we thoroughly compared the conditions offered by the two websites (see Table 1).

It turns out that the two sites differ in one fundamental aspect which is the incentive given to suppliers to participate in auctions. While LetsWorkIt clearly favours

**Table 1** Contractual Terms of the Reverse Auction and the Bid Invitation Platform

	<i>Reverse Auction</i> ( <a href="http://www.LetsWorkIt.de">http://www.LetsWorkIt.de</a> )	<i>Comparison</i> ( $\chi$ different; $\approx$ identical/similar)	<i>Bid Invitation Platform</i> ( <a href="http://www.jobdoo.de">http://www.jobdoo.de</a> )
Fees	No fees for the buyer. Suppliers pay between 1% and 4% of the contractual volume, depending on the size of the contract.	$\chi$	All fees to be paid by the buyer. 0,99 € + provisions between 1% and 3,5% of the contractual volume, depending on contract size. Additional fees for features such as extra photos etc.
Starting Price	Buyers are asked to state a maximum they are willing to pay, which serves as the starting price of the auction.	$\approx$	Buyers are asked to state a maximum they are willing to pay, which serves as the starting price of the bid invitation.
Selection of the Winner	The bidder with the lowest bid wins.	$\chi$	Winner is freely selected among all bidders by the buyer within a 2 week time frame. If the buyer fails to make a choice within this time frame, the contract is automatically awarded to the lowest bidder.
Registration Fee	Free of charge for buyers and suppliers.	$\approx$	Free of charge for buyers and suppliers.
Registration Procedure	Suppliers have to prove that they are properly registered with the authorities by sending in appropriate documents (e.g. copies of incorporation certificates etc.).	$\chi$	For a fee of € 5 the site verifies the bidder's qualification which is then displayed to the buyer.
Reputation System	Five categories: very good (+1), good (+1), satisfactory (0), sufficient (-1), inadequate (-1). Reputation is calculated as the sum of the point values in brackets. Based on this score, symbols indicating the degree of reputation are displayed next to the user's name.	$\chi$	Three categories: positive (counts +1), negative (counts -1) and neutral (leaves the counter unchanged). Based on the number of positive evaluations, symbols indicating the level of reputation are displayed next to the user's name.
Termination Rule	The auction ends after a fixed duration, which can be predefined by the buyer.	$\approx$	The bid invitation ends after a fixed duration, which can be predefined by the buyer.
Bidding Agents	Available	$\approx$	Available

the buyer by making suppliers pay for participation, jobdoo makes buyers pay and suppliers participate for free. The same customer approach is mirrored in the registration procedure: While LetsWorkIt wants to protect its buyer base by forcing suppliers to enrol in a formal registration procedure before doing any business, jobdoo imposes no such transaction cost on its supplier base and only offers qualification checks as an extra service. LetsWorkIt's reputation system is much more granular than jobdoo's offering buyers more transparency, but also exposing suppliers more. Last but not least, the two platforms pursue fundamentally different strategies in the selection of contract winners: while LetsWorkIt makes sure that the cheapest bid always wins, jobdoo maintains more room for supplier differentiation leaving buyers the option to choose on more criteria than just price. Section 5.3. will grant an insight into the effects of either of these strategies on consumer surplus.

## 4.2 Data Acquisition

From the reverse auction platform LetsWorkIt data sets of 1.124 auctions from 7

bidding categories with a total auction value of € 755.000 were retrieved. The auctions have been conducted from June 2004 to April 2005. The same data search on jobdoo delivered data sets of 1.422 bid invitations, with a total bidding volume of € 1.4 million. These bid invitations took place between November 2004 and March 2005. The distribution of data sets among the various service categories is summarised in Table 2. For both platforms

number of bids and bidders, seller reputation score, starting and ending dates as well as starting and final prices of each auction were retrieved. Please note that the procurement platforms under analysis here use the buyer's stated willingness to pay as the starting price for the procurement process. Contrary to the study from Bapna et al. quoted above, this WTP value is not kept secret but can be publicly observed by all potential suppliers. As a consequence,

**Table 2** Distribution of Data Sets among Various Bidding Categories

<i>Demand Category</i>	<i>No. of Reverse Auctions Analysed</i> ( <a href="http://www.letsworkit.de">http://www.letsworkit.de</a> )	<i>No. of Bid Invitations Analysed</i> ( <a href="http://www.jobdoo.de">http://www.jobdoo.de</a> )
1. Construction (and Renovation)	503	439
2. Painting and Varnishing	217	249
3. Computer and Media	86	206
4. Relocation and Transportation	95	143
5. Cleaning and Household	41	221
6. Gardening	132	80
7. Marketing / Publicity	50	84

some buyers might be hesitant to reveal their true WTP. Although being preferable from a methodological point of view, using an agent was not an option in this case, as the reverse setting requires the buyer to reveal his WTP to the platforms beforehand and because the platforms' terms and conditions did not provide the possibility to keep this information secret. As a result, there may be a tendency to underestimate consumer surpluses in the analysis presented. However, the possible error is limited because buyers have an incentive not to reduce their starting price too much, as this might cause the procurement process to fail.

## 5 Results

### 5.1 Success Rates and Intensity of Competition

The first research question as outlined in section 3 was whether B-2-C reverse procurement platforms are able to match supply and demand and to initiate a competitive bidding process. Success rates and the intensity of competition were analysed using the number of bids as well as the number of bidders present in auctions

across categories. An auction was termed "successful" if at least one bid was submitted. Table 3 displays success rates and the intensity of competition for the different service categories on both platforms. The data show that on average 75% of jobdoo and 62% of LetsWorkIt's auctions are successful. For comparison, Lucking-Reiley [Luck00, 249] determined success ratios of 54% for eBay auctions after 3 years of operation, of 38% for auctions at Amazon and of only 16% for auctions at Yahoo. This shows that reverse procurement platforms in a B-2-C context can – at least in the service sector – be very successful in matching supply and demand. Moreover, once bidding does take place it can become quite competitive on both platforms. For example, for the bid invitation platform jobdoo 34% of all auctions attract over 10 bids.

Table 3 also shows that painting & varnishing as well as computer & media are those categories that attract the highest bidding intensity while household services, gardening and transportation lack behind. Are reverse procurement platforms better suited for some product- and service categories and less so for others? It is not possible to give a conclusive answer on what drives this ranking. Yet, it is interesting to note that the ranking is identical or very si-

milar for both platforms. This suggests that there may be some consistent underlying factors driving the success rates of different service categories. One possible factor explaining bidding intensity could be the online affinity of the supplier base. A low online affinity of those offering gardening, household and transportation services as well as a high one for those offering computer services may lead to the respective presence of bidders. Yet, high bidding intensity in the painting and varnishing category suggests that additional factors play a role here as well.

### 5.2 Comparison of Procurement Auction Prices with Traditional Markets

The analysis so far shows that procurement auctions are able to attract demand and supply. However, this does not answer the question whether prices obtained through these auctions are lower than prices available in traditional markets. Therefore, a subset of 31 bid invitations and 14 reverse auctions from the "painting" category were analysed in more detail and compared with reference prices from this industry. According to calculation guidelines published by a painter association for its members, an

**Table 3 Bidding Intensity**

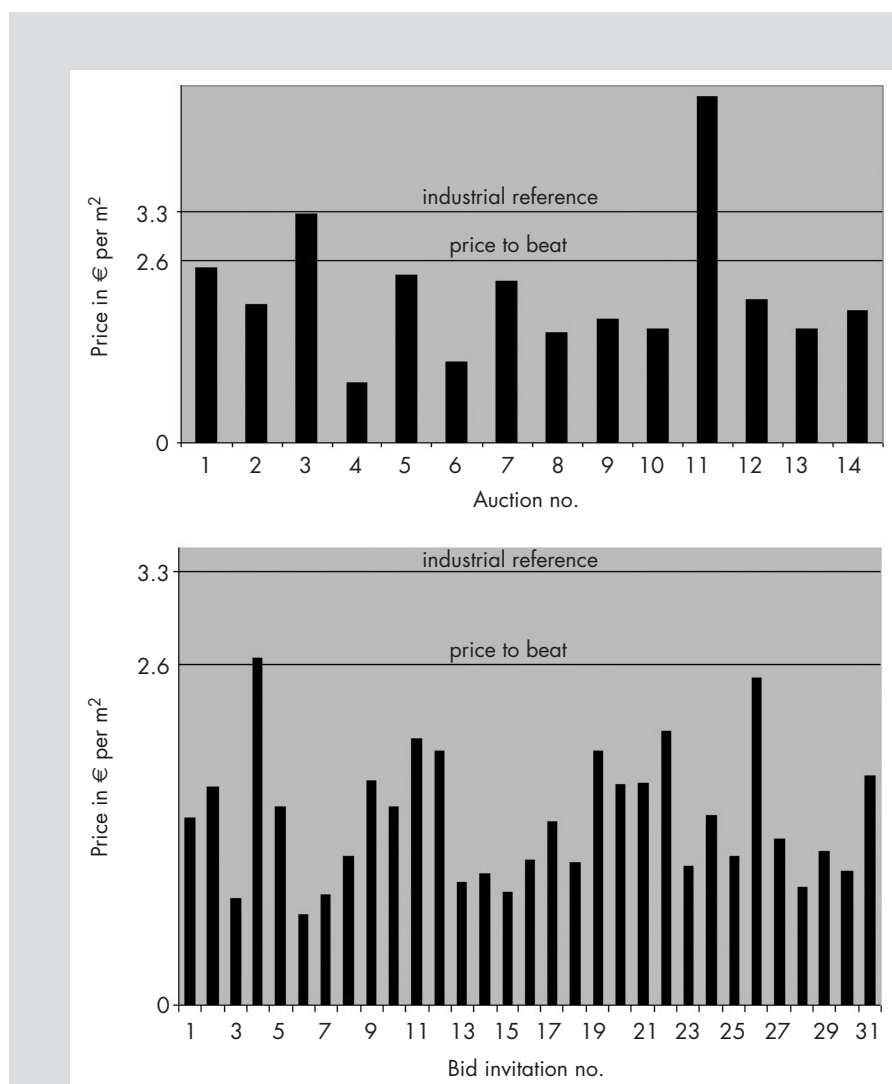
		very competitive auction (≥ 20 bids)	competitive auction (10–19 bids)	moderately competitive auction (2–9 bids)	no competition 1 bid	failed auction 0 bids	bidding intensity rank per category*	average no. of bidders in successful auctions	Sample size
jobdoo	Construction	11%	16%	33%	13%	27%	5	4,4	439
LetsWorkIt		12%	13%	24%	13%	39%	3	3,4	503
jobdoo	Painting & varnishing	26%	31%	25%	6%	12%	1	6,1	260
LetsWorkIt		21%	14%	31%	10%	23%		4,3	217
jobdoo	Computer & media	10%	29%	32%	7%	22%	2	5,3	206
LetsWorkIt		14%	15%	26%	11%	35%		3,9	86
jobdoo	Relocation & transportation	4%	17%	38%	14%	27%	7	3,3	143
LetsWorkIt		1%	8%	27%	24%	39%	6	2,3	95
jobdoo	Cleaning & household	9%	17%	41%	12%	21%	6	4,2	221
LetsWorkIt		2%	5%	17%	39%	37%	7	1,8	41
jobdoo	Gardening	5%	25%	33%	15%	22%	4	3,1	80
LetsWorkIt		5%	6%	30%	14%	45%	5	2,4	132
jobdoo	Marketing & publicity	10%	25%	27%	6%	32%	3	5,8	84
LetsWorkIt		4%	8%	26%	16%	46%	4	3,0	50

\* rank at the respective platform, based on competitive and very competitive bids

appropriate price for the repainting of in-grain wallpapers is approximately € 3.30 per m<sup>2</sup> [Ausb03]. The authors then searched for more competitive offers, obtaining one for € 2.60 per m<sup>2</sup>. As this second offer is already well below the € 3.30 industry benchmark, we would argue that € 2.60 can be regarded as a good rule of thumb for a market reference price. The subset of auctions chosen for comparison reduced the initial sample of over 200 auctions in the painting category to 31 (for bid invitation) and 14 (for reverse auctioning). The reason for this is that only those auctions could be used for analyses which were identical in service nature. Thus, we exclusively chose offerings related to repainting of wallpapers inside a building. In some of these auctions, paint was said to be provided by the buyer, so that price adjustments had to be made in order to cover the additional paint cost, adding 0.40 € per square meter to the respective auction prices.

Comparison of the bid invitation platform results with the lowest reference price revealed that prices obtained at the bid invitation platform were cheaper in 30 of 31 cases analysed. Savings obtained by consumers ranged between 3.8% and 73.3%. The mean price difference between the two reference prices available and the 31 bid invitation results is significant with  $p = .008$ . Only one of the bid invitations led to a price above the offline reference value (+1.9%). The analysis of reverse auctions for painting services delivered a similar result. 12 out of 14 auctions were able to beat the cheapest market reference price with savings ranging between 3.9% and 66.9%. Due to the small sample size and one outlier, significance of this difference could, however, not be confirmed ( $p = .100$ ). Figures 1 a) and b) depict the distribution of painting reverse auction results in comparison to the reference prices of € 2.60 and € 3.30.

The comparison indicates that, at least considering the paint category, B-2-C reverse procurement platforms can lead to real savings for consumers. A second analysis revealed that absolute prices achieved in the bid invitations were significantly lower than in the reverse auctions ( $p = 0.005$ ), thus rejecting H4 for this particular case. Of course it may be argued that low prices could also be obtained using traditional procurement processes if the buyer is a good negotiator. However, reverse auctions and bid invitation platforms may relieve consumers from the difficult and sometimes unpleasant task of negotiating face-to-face.



**Figure 1** Price distribution of painting bid invitations and reverse auctions in comparison to traditional market reference prices

### 5.3 Consumer Surplus

Besides the analysis of consumer benefits in real terms we also formulated four hypotheses relating to consumer surplus. Consumer surplus is defined as the difference between a consumer's willingness to pay (WTP) and the price he actually pays [SiWü00, 733]. In the empirical analysis presented hereafter, consumer surplus is determined by subtracting the final procurement price of a service from the buyer's initially stated maximum price. This stated maximum price is equalized with a buyer's willingness to pay.

We acknowledge that this is not an exact measurement but an approximation of WTP. As the marketing literature correctly

observes, it is difficult to determine WTP with transaction-oriented approaches. This is because WTP implies the extraction of the *real value* which a good has for a consumer – a value not readily disclosed in a transaction process. As Spann et al., for example, have pointed out, risk-neutral consumers are motivated to maximise the expectation value of consumer surplus [SpSS04, 23–24]. In our present context, this leads to a trade-off which challenges WTP measurement: On one side, consumers have an incentive to reveal their true WTP, because a higher starting price increases the success rate of the auction. On the other side, disclosing a high WTP also increases the risk of surplus skimming by suppliers, particularly in narrow markets.

**Table 4 Median of Relative Consumer Surpluses in Various Bidding Categories**

<i>Demand Category</i>	<i>Relative Consumer Surpluses at the Reverse Auction</i> ( <a href="http://www.LetsWorkIt.de">http://www.LetsWorkIt.de</a> )	<i>Relative Consumer Surpluses at the Bid Invitation Platform</i> ( <a href="http://www.jobdoo.de">http://www.jobdoo.de</a> )	<i>Difference in Relative Consumer Surpluses</i>
1. Construction (and Renovation)	15.1%	17.4% (n = 260)	2.3%
2. Painting and Varnishing	23.4%	40.5% (n = 199)	17.1%
3. Computer and Media	51.5%	51.2% (n = 122)	-0.3%
4. Relocation and Transportation	1.4%	18.3% (n = 88)	16.9%
5. Cleaning and Household	0.0%	20.0% (n = 146)	20.0%
6. Gardening	4.3%	15.6% (n = 34)	11.3%
7. Marketing / Publicity	13.0%	40.1% (n = 40)	27.1%

In order to avoid the latter effect, some consumers might have deliberately understated their WTP and thus the auction's starting price. However, more precise methods for WTP determination such as Vickrey auctions or Becker, DeGroot and Marschak's procedure (see [WeSk02] for a discussion) were not applicable in the reverse settings under analysis here. Furthermore, the authors were restricted to the existing platform procedures which provided for the disclosure of a reserve price.

In our study, we expressed consumer surplus in relative terms, because the perception of a 10 € surplus on a 10.000 € car must be distinguishable from the same surplus on a 100 € CD player. For all demand categories the respective median of relative consumer surplus was extracted. Please note that jobdoo's sample size had to be reduced for this analysis due to some auctions terminated anonymously (meaning that final prices paid were not revealed). Table 4 summarizes the results.

As Table 4 shows, both procurement platforms are indeed able to create considerable consumer surplus across all service categories. The median of relative consumer surplus reaches up to 52% in the computer & media category of both platforms. With such ratios a strong case can be made for the use of reverse procurement auctions in a B-2-C environment.

## 5.4 Factors Driving Consumer Surplus

In order to investigate the drivers of relative consumer surplus, we tested four research hypotheses derived from the literature and formulated in section 3. More specifically, we hypothesised that consumer surplus would be correlated with the number of bidders, the duration of an auction

and the starting price. An initial correlation analysis revealed that for reverse auctions a medium to high correlation typically exists between the number of bidders and the relative consumer surplus. The same is true for bid invitations, although at a somewhat lower level (see Table 5). Therefore, Hypothesis 1 claiming that there is a correlation between relative consumer surplus and the number of bidders can be confirmed for all service categories investigated.

Correlation analyses conducted for the other two Hypotheses 2 and 3 showed no impact of auction duration and starting price on consumer surplus. Correlations are very low or low and non significant. Thus, the duration of an auction (Hypothesis 2) does not lead to lower prices. Equally, the starting price has no immediate influence on how consumer surplus develops (Hypothesis 3).

The findings of the correlation analysis have been further confirmed by a multi-

variate regression analysis conducted for the largest service categories with over 80 auctions. Model 1 only used the number of bidders as a predictor for relative consumer surplus. Model 2 added auction duration and starting price as additional independent variables in order to see how much these variables improve prediction accuracy. For the three parameters, tests for multi-collinearity (analysing the variance inflation factor) and correlatedness among the residuals (Durban-Watson coefficient) were performed to assure compliance with modelling requirements. All tests turned out to be negative and the distribution of relative consumer surplus was reasonably close to normal distribution. All modelling requirements were thus fulfilled. According to the adjusted  $R^2$ -values resulting from Model 1, number of bidders alone is able to explain between 28.7% of consumer surplus variance for computer and media bid invitations and 60.8% of consumer surplus variance for the building and

**Table 5 Confirmation of a Positive Correlation between Relative Consumer Surplus and Number of Bidders**

<i>Category</i>	<i>Reverse Auction</i> <a href="http://www.letsworkit.de">http://www.letsworkit.de</a>	<i>Bid Invitation Platform</i> <a href="http://www.jobdoo.de">http://www.jobdoo.de</a>
	<i>Correlation Coefficient</i>	<i>Correlation Coefficient</i>
Construction and Renovation	0.780**	0.660**
Painting and Varnishing	0.757**	0.689**
Computer and Media	0.771**	0.541**
Relocation and Transportation	0.778**	0.752**
Cleaning and Household	0.817**	0.601**
Gardening	0.835**	0.715**
Marketing / Publicity	0.879**	0.643**

\*\* correlation significant at the .01 level

**Table 6** Adjusted R for Model 1 and Model 2

	sample size (n)	adjusted R <sup>2</sup>	
		Model 1 (Number of Bidders)	Model 2 (Number of Bidders, Auction Duration, Starting Price)
<b>Reverse Auction</b>			
Building and Construction	301	.608	.609
Painting and Varnishing	162	.572	.573
<b>Bid Invitation</b>			
Building and Construction	260	.433	.433
Painting and Varnishing	199	.472	.469
Computer and Media	122	.287	.278

construction auctions.  $R^2$ -values for reverse auctions are consistently higher than for bid invitations suggesting that bidding intensity bears more explanatory potential where pure price competition is at play.

Adding the two other variables starting price and auction duration (Model 2) however does not enhance the prediction accuracy for reverse auctions (adjusted  $R^2$  increases only by 0.1 percentage points). In contrast, it even decreases it by up to 0.9 percentage points for the bid invitation platform, as Table 6 shows.

The finding that starting price and auction duration have no explanatory value for relative consumer surplus is further confirmed when employing path analysis. The fundamental difference between path analysis and a regression model is that independent variables may also serve as dependent variables [JösSö93]. Delving into the details of jobdoo's building and construction category we investigated whether starting price and auction duration could potentially be predictors of the number of bidders while number of bidders directly influences consumer surplus. Maximum likelihood estimates with LISREL 8.54 showed though that the variance of number of bidders cannot be explained by auction duration or starting price ( $R^2 = .011$ ). We therefore conclude that the analysis of bidding intensity and consumer surplus should not focus on auction duration. Longer or shorter auction duration periods do not seem to explain why professionals bid. As far as starting price is concerned the findings equally suggest little relevance for bidder participation. However, we do not want to exclude that this variable could still be important in another form. This is, because we were only able to measure ab-

solute starting prices and their variance. What we could not include in our analysis is the relation of starting prices with the true value of a service. After all, reverse procurement formats allow professional bidders to observe a proxy of the consumers' willingness to pay. If the relation between this WTP or starting price and the actual service value signals that a consumer (buyer) overestimates a service's true value, then service suppliers may indeed have an incentive to participate in the auction. Unfortunately, measuring the degree of information asymmetry on real service value was out of the scope of this analysis.

Despite identifying the number of bidders as an important driver for consumer surplus, the results obtained also show that a large amount of consumer surplus variance remains unexplained. These parts of the variance seem to be influenced by other factors which have not been covered by our analysis. One point influencing consumer surplus might, for example, be the quality of the task description provided by a buyer. Imprecise descriptions of needs could lead to more cautious bidding by suppliers who cannot properly estimate the requirements they will be nailed to. Furthermore, information asymmetries as explained above may be an explanatory factor. Equally, branding could have played into final choices at jobdoo. All in all, insights from traditional English auctions do not seem to grasp all mechanisms at work with reverse auctions. More basic research on bidders and buyers is therefore needed to understand the dynamic behind consumer surplus development in reverse B-2-C procurement settings.

## 5.5 Reverse Auction Formats: a Comparison of Two Mechanisms from a Consumer Surplus Perspective

In section 3 we hypothesised that due to pure price competition reverse auctions would be more effective in maximizing consumer surplus than bid invitation platforms. Yet, as was shown above in Table 4 consumer surplus is consistently higher for the bid invitation platform. Hypothesis 4 must therefore be declined. One major reason for surplus levels is, as proven in section 5.3, bidding intensity. Throughout all auction categories it becomes evident that bid inviter jobdoo attracts a higher bidding intensity and thus more competition than this is the case for reverse auctioneer LetsWorkIt. The observation is mirrored in the number of bidders participating. Here, jobdoo has an average of 4.6 different bidders per auction while LetsWorkIt has only 3.

It is of course questionable to what extent strong bidding intensity can purely be attributed to the bid invitation procedure itself. Potentially, jobdoo could have been better at marketing than its competitor, making it better known among bidders. Discussions with a marketing agency which is active in this field suggest though that the two platforms saw a comparable level of marketing activity and news presence during the time of analysis. Website usability and features are comparable as well. This leads us to argue that other parameters must be at work driving jobdoo's relative success. Drawing from available information, quite some explanatory value will certainly lie with the companies' diverging supplier strategies. As outlined in Table 1, jobdoo's auction procedures are much more favourable for suppliers than LetsWorkIt. Stronger supplier participation therefore seems rational.

Another driver of relative success may be the reverse procurement mechanism's interplay with a product category. In contrast to LetsWorkIt, jobdoo allows to make a purchase choice on more than just price. Where the nature of a service is relatively homogenous, price is what finally counts most for buyers. The reverse auction's purely price based mechanism therefore plays at its favour here. Yet, in contrast, when buyers procure services that bear higher levels of personal or social risks, then they may prefer a platform like jobdoo where they maintain a final choice that can be made upon factors beyond price. Consequently, jobdoo's bid invitation me-



**Table 7 Parameters Determining Supplier Selection at jobdoo**

The service provider that jobdoo-buyers chose...	... were the cheapest.	... were the ones with better reputation.	had other, non measurable characteristics	... were the only one bidding.
Construction and Renovation	54.0%	9.6%	18.5%	17.9%
Painting and Varnishing	53.8%	17.1%	23.6%	6.5%
Computer and Media	59.8%	9.2%	22.1%	9.0%
Gardening	57.1%	5.7%	11.3%	25.7%

chanism may be more successful in those product categories where 'softer' purchase criteria count.

The fact that many buyers chose suppliers on soft criteria is proven by the figures in Table 7. They show how jobdoo buyers take their final purchasing decision. Even though price clearly dominates this choice with around 55% of buyers going for the cheapest offer, reputation and other, non measurable criteria (such as brand?) also seem to determine around 30% of the final choices. The question is what these factors are and how they are related to the product category. According to jobdoo data (Table 7) around 10% may be due to the reputation rank a buyer has earned. We identify this as an area of future research.

der to be sure that this finding is generalizable, it would certainly be interesting to better understand why this is the case. The argument we could discern here is that incentives offered by a platform to motivate supplier participation leads to higher bidding intensity and then, subsequently, to higher consumer surplus. Yet, more insight is needed to explain consumer surplus variance. Here the product category comes into play as well as softer purchase criteria. Also, a comparison of product sales success with other online auction (e.g. eBay) or traditional markets would be highly interesting. Other issues we could not analyse within the scope of this study are the effects which highly competitive bidding environments might have on quality and market structure.

Finally, the mechanisms for reverse auctions and bid invitation platforms for consumers still need to be improved. Future efforts should focus on the development of tools supporting bid invitation elaboration. As a review of bid invitations posted on jobdoo revealed, many task descriptions are still inaccurate, which might be a cause for disagreements and discontent. Therefore, tools are needed which systematically guide consumers through the preference specification and elicitation process. A good example for such tools are relocation auction sites like 'Umzugsbörse Online', which provide checklists in order to ensure that the consumer provides all data needed by the supplier. In the future, such tools should also be developed for other bidding categories.

## 6 Conclusion, Limits and Outlook

The analysis of empirical data from consumer-oriented reverse procurement platforms revealed that such online platforms are able to match demand and supply efficiently, as far as services and crafts are concerned. In these categories, both platforms were able to achieve a higher 1-year success rate than traditional auction sites like eBay, Amazon and Yahoo! have seen. Furthermore, it could be shown that, in the painting category, prices at the bid invitation platform are consistently lower than reference prices in the traditional marketplace, thus creating real added value for the buyer. Consequently, we believe that such procurement platforms will gain in popularity if consumers are rational. Yet, the limits of our analysis are also evident. Since we only analysed crafts and services, we cannot generalize our findings.

Both platforms generated consumer surpluses. Yet, we showed that the bid invitation platform attracted a higher number of bidders and lead to higher surpluses. In or-

### Abstract

#### Reverse Procurement and Auctions for Consumers – A New Trend on the Horizon of E-Commerce?

Web-based reverse auctions and bid invitation platforms have been used successfully for the procurement of goods and services in B-2-B and B-2-G contexts for some time. More recently, such procurement tools have become available to consumers and are increasingly gaining in popularity. An empirical examination of more than 1400 bid invitations and over 1100 reverse auctions shows that these two types of platforms generate noteworthy consumer surpluses, with the number of bidders being by far the most relevant factor in the determination of surplus levels. Contrary to traditional auction environments like eBay, auction duration and starting prices turn out to be of little relevance for consumer surpluses, as correlation and regression analyses show. The analysis of procurement data further reveals that consumer-driven platforms are particularly suitable for purchases of crafts and services where they provide an efficient mechanism to bring together buyers and sellers and match supply and demand. An exemplary review of results from painting auctions indicates that the price level achieved by consumers in reverse e-procurement is below reference prices which can be obtained in traditional procurement channels. Being an attractive alternative, reverse e-procurement platforms could bring about a paradigm shift towards buyer-centred e-purchasing.

**Keywords:** Reverse Auctions, Consumer Surplus, Bid Invitations, Procurement

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Auction sites and bid invitation platforms:  
<http://www.umzugsboerse-online.com>  
<http://www.letsworkit.de>  
<http://www.jobddoo.de>