Summary of Findings for Non-academic Audience from the Paper "Imperfect Competition in Online Auctions" by A. Maslov and J. A. Schwartz.

E-commerce has substantially transformed ordinary retail markets. It also influenced the evolution of selling mechanisms and their contextual applications. Sealed-bid auctions were prevalent before the advent of the Internet, but have lost their popularity due to a drastic improvement in the communication technologies and reduction of search costs for buyers.

One of the important attributes of e-commerce is the ease of trading. Previously, companies had to incur fixed costs to set up at least one distribution channel. Reselling those items after the purchase was also problematic due to high search and coordination costs. These days, any individual may almost costlessly bring a product to an online consumer-to-consumer (C-2-C) market, whether for the purposes of resale or as a uniquely crafted item. The latter tendency produces a distinctive environment in which there may be only a few sellers offering small number of homogeneous goods to a large pool of buyers. The discussed paper considers competition between two sellers, which is known as a duopoly in economics.

C-2-C platforms vary not only in their purpose, but also in the selling mechanisms that are available to sellers. The most popular selling mechanisms are posted prices, auctions and auctions with a buy-it-now price (eBay also has the "best offer", which is effectively a first-price sealed-bid auction). There are several broad online markets where auctions are dominating as selling mechanisms, e.g., eBid, AuctionZip or LiveAuctioneers. Other platforms are more targeted. For example, Propertyroom helps law enforcement agencies to auction out seized, stolen, abandoned and surplus items, which is required by law. Shopgoodwill receives all of its goods (mostly clothing and household items) from donations and then auctions them out to the public. It further uses received profits to provide job training in the USA. Listia does not use money at all, but gives credits to consumers for donating items, which could be used later to bid at the website.

The sparse theoretical and empirical literature on competing online auctions investigates the behavior of buyers or final purchase prices. This paper, on the other hand, is mainly interested in how competing sellers choose their reserve prices. It shows that even with the same costs, the first-arriving seller chooses a reserve price just low enough to safeguard against being undercut by the second seller, and the first-arriving seller makes more profit than the second-arriving seller. This paper also has a methodological contribution. It shows how Myerson's optimal auction design can be extended to a case with two sellers receiving some part of the expected revenue generated from the buyers (Myerson 1981).

The paper's focus is on the competition in auctions and hence it does not consider a situation when a seller may choose another selling mechanism, e.g., posted price. Analyzing a decision of a seller choosing among several selling mechanisms is a complex task by itself, which is further exacerbated by the complexity of buyers' behavior when faced with a choice to buy the same item from different mechanisms. eBay is an ostensible example of such market. There are four different options to list an item on eBay: posted price, second-price ascending auction, auction with a buy-it-now price and best offer, which is effectively a sealed-bid first-price auction.

The model developed in this paper covers one story exactly and another story approximately. The exact story has a centralized auction taking place at some specified date. Prior to this date, seller a arrives and selects reserve price r_a and then seller b arrives, observes r_a, and selects reserve price r_b.

Each buyer submits a sealed bid. The allocation is according to the seller-offer double auction, which works as follows. Make a single list, sorting the reserve prices and bids from highest to lowest, with ties ordered randomly. Set price P equal to the reserve price or bid in the n^{th} lowest position on this list. All sellers amongst the n^{th} lowest positions will sell a unit and receive P dollars; all buyers with values in the remaining 2 higher positions will purchase a unit and pay P dollars. The remaining sellers and buyers do not transact. This means that the price paid by each winning buyer is set by either a losing buyer or a seller, but not his own bid. Thus, every buyer has a dominant strategy to bid his value so that he wins a unit if and only if profitable to do so. But a seller can both sell a unit and set the price, distorting his incentive to set a reserve at his cost.

The approximate story is that the selling procedure is decentralized. Sellers arrive sequentially and set reserve prices as before, but this time each seller activates a separate ascending price auction. Once all of the reserve prices are chosen, the auctions begin, and buyers can bid in any of the auctions. The auctions end when some period of time passes with no further bids. Peters and Severinov (2006) have treated a similar environment in which sellers choose reserve prices simultaneously and have independent private costs. They further assumed a finite grid of allowable prices in the auctions coinciding with the supports that the sellers and buyers draw their costs and values from. A key result in Peters and Severinov (2006) is that there exists a perfect Bayesian equilibrium in the bidding game, in which each buyer bids minimally as needed, only bidding in the auction with the lowest price whenever that buyer is not already the highest bidder in one of the auctions and that the lowest price is less than his value. Such a strategy could be implemented by a computerized algorithm or machine proxy. If all buyers used it and if the bid increments became finer and finer, the selling procedure would be strategically and outcome equivalent to the seller-offer double auction described above, in the same way that Vickrey (1961) found strategic equivalence between a single-unit second-price auction and an ascending price auction in a private-values setting.

Previous research on the design of auctions has shown that when there are many sellers and buyers in online markets, the reserve prices set by the sellers are equal to their marginal costs. In contrast to sealed-bid auctions characterized by simultaneous choice of reserve prices, it is unlikely that in online markets sellers choose reserve prices simultaneously. Rather, a seller who comes to the market first, chooses a reserve price knowing that another seller will arrive after him. In principle, sellers may have a good estimate of how many competitors to expect. Such a strategic environment could be seen as a Stackelberg model with reserve prices as the choice variable – one of the three baseline models of competition in industrial organization, where one firm takes the lead by arriving to the market first.

In some spirit this paper is similar to Burguet and Sakovics (1998), who show that the results of Mcafee (1993) and Peters and Severinov (1997) hold only for large markets where many sellers offer sealed-bid auctions. The crucial feature of the environment considered by this literature is the commitment of buyers, who could no longer switch to another auction after placing a bid in one of them. Burguet and Sakovics (1998) argue that in a duopoly reserve prices are no longer driven to marginal costs. The authors consider simultaneous choice of reserve prices by the sellers and find that the equilibrium exists only in mixed strategies, which effectively means that sellers are randomizing their decisions across a support of reserve prices. When the choice of reserve prices is sequential (which reflects the observed regularities in online markets), this paper shows that there is a unique pure-strategy Nash equilibrium, in which the first-moving seller sets a reserve price low enough to protect from being undercut by the second-arriving seller. The latter means that both sellers' actions are optimal for them given the actions of the competitor. None of the sellers can increase his/her profit by choosing a different reserve price. Because the first seller earns a higher profit in the equilibrium, each seller has an incentive for some strategic move in which he/she commits to a reserve price prior to the other seller thereby making an assumption about simultaneous choice of prices fragile.

The empirical literature has shown that the predictions of Peters and Severinov (1997) do not hold ubiquitously, at least on eBay. Specifically, Zheng (2000) and Haruvy and Popkowski Leszczyc (2010) did not find cross-bidding behavior in ascending auctions, nor resulting uniform prices. The main explanation for their result is the timing of the auctions – in reality not all auctions start and end at the same time. Hence, buyers do not have an incentive to cross bid in them unless the standing prices equalize (which may take some time if the difference in reserve prices is substantial). Huang et al. (2007) developed a model to account for overlapping auctions, but due to somewhat different environment it is hard to reconcile it with the other literature. Another reason why cross-bidding behavior may fail is simply due to exponentially increasing cognitive overload for a bidder in terms of his/her time and effort to monitor a large number of simultaneous auctions (McCart, Kayhan, and Bhattacherjee (2009)). On the other hand, the same authors found evidence of cross-bidding behavior and argued that experienced buyers are able to avoid the aforementioned overload (Kayhan, McCart, and Bhattacherjee (2010)). Today, existing technologies allow buyers to implement optimized algorithms bidding on their behalf, which presumably resolves this problem. Nevertheless, Backus, Podwol, and Schneider (2014) argue that the observed final price dispersion for homogeneous items may well be due to the additional search costs incurred by buyers, which prevent them from cross bidding. Another possible explanation is the differences in the structure of the network defining buyer-seller meetings in the market (Donna, Schenone, and Veramendi (2020)). Andersson et al. (2012) used a unique dataset on train tickets in which competing auctions started and ended at the same time. They found strong evidence of cross-bidding behavior and price uniformity predicted by the theory. Anwar, McMillan, and Zheng (2006) also found significant evidence for cross-bidding behavior on eBay when considering auctions with almost the same end time. The model developed in this paper assumes that auctions do not have a significant difference in their timing and thus circumvents both of the above-mentioned issues.

The paper shows that just like in the environment considered by Burguet and Sakovics (1998), competition between two sellers competing in online auctions is not enough to drive reserve prices to marginal costs. To our knowledge, there is no empirical literature examining the structure of reserve prices in online auction markets. The theory predicts variation to exist even with two sellers. This contrasts with a monopolist who sells items by auctions at the same optimal reserve price and a competitive market in which reserve prices are equal to marginal costs. The monopolist outcome may also arise if competing duopolists were to collude. Hence, the absence of variation in the reserve prices on particular segments of C-2-C markets could potentially be used as a test for collusion.

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