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Mechanism choice and the buy-it-now auction: A structural model of competing buyers and sellers☆

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ABSTRACT

A striking feature of many online sales platforms is the coexistence of multiple sales mechanisms. Items on eBay, for instance, are frequently offered through auctions, posted prices, and buy-it-now auctions. In this article, I study how this mechanism multiplicity influences the welfare of buyers and sellers. I specify and estimate a structural model of mechanism choice in online markets, in which I consider both sides of the market: On the demand side, buyers' choices among available listings are equilibrium outcomes of an entry game. On the supply side, sellers make equilibrium decisions when choosing sales mechanisms and prices. I estimate this model using data from sales of baseball tickets on eBay and calculate consumer and seller rents in three markets: the actual market with all three sales mechanisms and two counterfactual markets with auctions and fixed prices or only fixed-price listings, respectively. I find that the addition of auctions to fixed-price markets hurts sellers and risk-averse buyers but benefits risk-neutral buyers. Additionally, the consumer surplus increases when buy-it-now auctions are offered but the seller surplus is reduced further. I discuss the intuition for the cause of this result.

1. Introduction

Online sales platforms have grown to be a major part of the US and world economies. In 2009, goods worth close to 60 billion dollars were sold on the websites of market leader eBay alone.[1] The rise of these platforms has introduced an abundance of new sales mechanisms. Particularly popular are mechanisms that incorporate features of both auctions and posted prices, like eBay's buy-it-now (BIN) auction.

In a buy-it-now auction, the seller sets two prices: a reserve price and a posted so-called "buy-it-now" price. The first arriving bidder has the option to either purchase the good at the buy-it-now price or to submit an auction bid greater than or equal to the reserve price. In the former case, the listing disappears as the item is sold. In the latter case, the listing turns into a standard eBay auction in which anyone can participate. The buy-it-now auction was introduced by eBay in 2000. Many of eBay's competitors now offer similar mechanisms; examples include eBid's "Buy Now" facility and uBid's "u Buy It" feature. Interestingly, most online sales platforms allow sellers to choose from a variety of mechanisms including auctions, posted price sales, and BIN auctions. Despite the success of these platforms, little is known so far about the revenue and efficiency implications of this mechanism multiplicity.

In this paper, I use sales data from eBay to examine this question. I develop and estimate a model of supply and demand in online markets. Based on my estimation results I then simulate two counterfactual markets: one in which all items are sold through posted prices and one in which auctions and fixed-price (FP) listings–but no hybrid form of the two–are available. This allows me to gain insight into the welfare effects spurred by the inclusion of auctions and BIN auctions into markets.

My main result sheds light on the effects of BIN auctions on consumer and seller surplus. One might think that sellers necessarily benefit from the BIN option. After all, both FP listings and auctions can be

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[1] eBay Annual Report. San Jose: eBay Inc., 2009.

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incorporated into BIN auctions by setting appropriate BIN prices equal to the reserve or to infinity, respectively. That is, BIN auctions weakly dominate both other mechanisms in my study. Contrary to this intuition, I find that sellers achieve lower revenues when BIN auctions are available compared to a situation in which they can choose only between auctions and FP listings. While it is individually optimal to choose a BIN auction, these devices strengthen competition so that the new equilibrium is less attractive to sellers. Instead, buyers benefit from the additional mechanism.

Intuitively, the availability of a hybrid mechanism makes competition between sellers fiercer: Assume there are two sellers, who offer their items simultaneously. Further assume that some buyers prefer to buy at posted prices,[2] while others ("neutrals") only care about the price and the quality of the good. One seller can list her item at a fixed price, while the other can target neutrals by offering an auction. In this case, demand should not be very elastic. Buyers who prefer posted prices are unlikely to enter the auction. Neutrals are not prone to enter the FP listings as auctions yield a more efficient outcome: A high value bidder might not receive the item at a posted price because someone else might beat him to it. In the auction however, he has a much higher chance of winning and obtaining the product.

Now compare this scenario to a setting in which BIN auctions do exist. We can think of the separation strategy as one seller setting the BIN price equal to the reserve price while the other sets the BIN price equal to infinity. However, now the sellers have incentives to deviate. For instance, the seller with BIN price of infinity (previously the auction seller) will now prefer to reduce the BIN price to a high but finite level. This gives her a chance to sell at a very high price, benefiting from buyers' preference for FP purchases. That is, now both sellers will compete for both types of entrants and thus will drive one another's prices down much more than before.

This result is reminiscent of two papers from the marketing literature: Lal and Matutes (1989) consider a setting in which two stores each offer two goods. Buyers of two types (rich and poor) want to purchase one unit of each good, where rich buyers have higher transportation costs than their poor counterparts. When the sellers split the market, so that each store charges a high price for one and a low price for the other good, they are better off than in an alternative equilibrium where they compete in both goods. This is because in the former case the stores are able to extract the total rent from rich buyers, who are unwilling to drive from one store to the other in order to get the low prices on both goods. In the latter scenario, equilibrium rich buyers benefit from the stores' competition over poor customers and pay lower aggregate prices. Similarly, Bakos and Brynjolfsson (2000) find that the potential to bundle goods hurts sellers in a competitive market place. This seems to be the case because by bundling the sellers make their goods more similar to each other and thus increase the substitutability between the two.

To study these effects, I develop a structural model of supply and demand. On both sides of the market, agents make equilibrium decisions. Buyers make purchases based on item and mechanism characteristics. When evaluating the listings offered, they take other buyers' expected decisions into account (i.e., a buyer might be hesitant to enter a listing which he deems particularly popular). This approach has to my knowledge not been used. Instead, previous authors have postulated random arrival or reduced the listing choice on the demand side to a single agent problem by ignoring the interdependence with other agents. The advantage of my approach is that it allows us to gain a deeper insight into competition among sellers. Sellers set mechanisms and (reserve) prices based on their revenue expectations, their outside options, and their listing costs associated with the mechanisms. They also have expectations about buyers' and other sellers' behavior and adjust their decisions accordingly.

A growing literature examines the effects of BIN auctions on seller revenues. Most authors in this line of work focus on monopolistic sellers. In this setting, sellers can benefit from the BIN auction if buyers act irrationally[3] or if either buyers or sellers are risk averse[4] or impatient.[5]

Kirkegaard and Overgaard (2008) study BIN auctions in markets with multiple sellers. They show that in sequential setting the first auctioneer can benefit from employing the BIN auction at the cost of the second seller. However, total seller revenues are lower than if only regular auctions were offered.

I contribute to this literature by estimating a richer setting in which sellers compete not sequentially but simultaneously. I estimate this model using sales data for Major League Baseball Tickets on eBay and then uncover the welfare effects of auctions and BIN auctions by comparing actual outcomes with those from two simulated marketplaces, one in which only FP listings exist and one with FP listings and auctions. I find that risk-neutral buyers benefit from the addition of auctions to posted price markets, while risk-averse buyers prefer markets with exclusively posted prices. Consumer rents are further increased (by more than 9%) when BIN auctions are introduced. Sellers, on the other hand, would prefer a situation in which only FP listings exist. Their surplus in this situation is 6.4% higher than in markets with both auctions and FP prices. The dual market, in turn, is characterized by a 9.7% higher seller surplus compared to a situation in which all three mechanisms are available. eBay itself also would be better off without BIN auctions, earning 18.6% higher revenues from fees, and would increase its returns by an additional 26.6% if it restricted sellers to offering only FP listings.

In light of these results it might seem surprising that multiple mechanisms coexist on eBay. The key observation that helps explain this puzzle is that even though eBay is by far the largest online auction platform, it faces numerous competitors. This has two important consequences. First, it is possible that buyers, realizing their benefit, are keen to have access to auctions and the BIN option; thus, abandoning these mechanisms might reduce eBay's buyer base. If this effect is strong enough, it might offset the calculated revenue loss and make offering auctions and BIN auctions an optimal strategy for eBay. Second, even though the group of sellers as a whole would benefit from the removal of auctions and BIN auctions, individual sellers can still benefit from using them. In fact, Hammond (2010) and Zeithammer and Liu (2006) independently find evidence that sellers' inherent heterogeneity, particularly with respect to inventory, leads them to adopt different sales mechanisms. Therefore, eBay might lose sellers that prefer auctions and BIN auctions if it were restricted to posted prices. In essence, sellers might face a prisoner's dilemma in which the coordinated action of abandoning auction mechanisms would make all or most sellers better off, but is not enforceable given the availability of other platforms.

This paper is most closely related to Hammond (2013), who studies how the duality of FP and auction listings affects welfare in the market. However, my work differs from his in three ways. First, Hammond models buyers' entry decisions as a single agent problem. In contrast, in my model buyers find an entry equilibrium, taking other buyers' expected choices into account. Second, in Hammond's paper buyers choose a mechanism before they see the available listings. Thus, they might get stuck in a mechanism which offers no items or only expensive ones. Buyers in this paper make a choice among all available listings, taking the available mechanisms into account. I believe that this is a more realistic setting and thus allows for a more accurate study of the

[2] There are several reasons why buyers might prefer posted prices over auctions. For instance, risk-averse buyers might choose to buy at fixed prices because this allows them to secure a surplus at a certain level, while in auctions they face the risk of competing with a high-value bidder and thus not winning the auction or paying a very high price. Another factor in favor of fixed prices is impatience. Auctions on eBay run for a pre-specified amount of time, while fixed-price listings end as soon as a buyer purchases the item. Thus, fixed-price listings often allow buyers to receive the item several days earlier than auction listings.

[3] Yoo et al. (2006); Popkowski Leszczyc et al. (2009); Shahriar and Wooders (2011).

[4] Reynolds and Wooders (2009); Sarin and Zhang (2011); Budish and Takeyama (2001), Hidvégi et al. (2006)

[5] Mathews (2004), Gallien and Gupta (2007).