

A Snapshot of Advances in Auctions Research:
Introduction to the Special Issue on Auctions of the
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Auctions have been used in one form or another since ancient times. Early examples frequently cited in the academic literature include the auctioning of brides by the Babylonians around 500 BCE as well as the use of auctions in ancient Rome for the likes of war booty, slaves, and debtors' properties—the entire Roman Empire was sold at auction by the Praetorian Guard after the murder of the Emperor Pertinax in 193 CE. Many wholesale agricultural and fisheries markets also have long histories of making use of different types of auctions. Auctions are also used to sell rare collectibles in prestigious auction houses; common household goods in estate auctions; financial instruments, electricity, and confiscated contraband in government-sponsored auctions; and nearly anything on the Internet at auction host sites which specialize in facilitating person-to-person, business-to-person or business-to-business transactions. Indeed, it is hard to identify goods or services that have not been traded at auction.

In the past few decades, the use of auctions has proliferated in two areas in particular. First, the aforementioned flourishing use of the Internet to facilitate or even to enable trade by establishing markets for all sorts of goods and services. And, second, auctions as a frequently preferred means for trades involving governments. Thus, much of the privatization waves in the aftermath of the demise of the Soviet Union as well as many other government divestitures, often tied to deregulation, have used auctions. Similarly, much of government procurement—from the purchase of office furniture in small municipalities, to the construc-

*The papers included in the special issue are available at the *Applied Economics Research Bulletin*'s website at <http://berkeleymath.com/BerkeleyJournal.aspx>

tion and maintenance of public highways at the county/regional/state level, to the purchase of fighter jets at the national level—is now conducted through some form of auction. Most notable, however, is the recent use of auctions as a means of allocating spectrum rights to private companies. The ubiquitousness of auctions has naturally led to a growth in academic research on auctions. However, this is surely not a one-way street. Indeed, as a case in point, the rather spectacular spectrum auctions conducted in many countries which have raised billions of dollars in revenue are the direct result of implementing new research insights gained in the design and operation of auctions.¹

The study of auctions by academic economists may be traced back to Vickrey's (1961) now-seminal paper,² in which he compares properties of the ascending-bid auction and the Dutch auction (indicating possible revenue equivalence), and then introduces the second-price sealed bid auction—which has since taken his name and is, thus, often referred to as the “Vickrey auction.” Many of the fundamental results in auction theory—which are often considered as part of an economist's set of basic tools—were established in the late 1970s and early 1980s, and are collected in several comprehensive surveys by McAfee and McMillan (1987), Milgrom (1989), and Wilson (1992). Since then research in auctions has dramatically expanded, with continued advances in auction theory and its applications being made by bringing the models closer to observed institutional settings. Summaries of the more recent theoretical advances are found in Wolfstetter's (1996) survey, later updated as a chapter in Wolfstetter (1999); Klemperer (1999), also reprinted in Klemperer (2004); and the more recent and very comprehensive volume by Krishna (2002).

Much of the early research on auctions went hand-in-hand with advances in game theory. However, theory was not the exclusive focus of the work done by academic economists studying auctions. Indeed, there has been independent research in the areas of empirical and experimental research which, in turn, has led to very productive cross-fertilization within the three research areas in auctions as well as in the practice of designing and conducting auctions. An excellent review of the earlier experimental work in auctions is found in Kagel (1995) which was revised and included in Kagel and Levin (2002). Laffont (1997) provides a nice survey of the earlier empirical work on auctions and Paarsch and Hong (2006) provide

¹See, e.g., Cramton (1995), Klemperer (2004), or Milgrom (2004).

²Vickrey's (1961) paper now has nearly 900 citations in the Web-of-Science citation index. While there are in excess of 50 citation per year in the last six years, the article was cited fewer than once a year on average during the first fifteen years since its publication.

an up-to-date introduction and overview of structural estimation techniques for auction data. Moreover, insights gained in the study of auctions have been transferred into other areas of economic research—Klemperer (2003 and 2004) advocates this transfer of insights and gives several examples, one of which is taken up and investigated in an experimental study by Dechenaux and Mancini (2008) in the present special issue. In addition to this paper, the special issue covers a very broad range of areas, topics, and applications in modern auction research. Nevertheless, it necessarily contains only a snapshot of the larger picture, given the breadth of contemporary auction research.

The first three papers in the special issue—Harstad (2008), Lu (2008), and Mathews and Sengupta (2008)—are concerned with broadening our theoretical understanding of auction design and the implications of auction design on bidder behavior, optimal bidding, and the revenue that is generated in an auction. Mathews and Sengupta—following in the footsteps of Chwe (1989) and Rothkopf and Harstad (1994)—depart from the near-universal assumption that bids placed in an auction are freely chosen from a continuum and examine how optimal bidding strategies are affected in second-price, sealed-bid auctions when bids are restricted to come from a discrete grid. They show that bidders may find it optimal to place bids above their value and they establish that compared to a continuous bidding space, the choice of discrete bids available to the bidders may increase the auctioneer's revenue.

The papers by Harstad (2008) and by Lu (2008) are also concerned with the revenue generated in an auction. However, their focus is on the implications of the bidders' participation decision. They go beyond traditional models in auction theory by examining cases in which participation in the auction itself is endogenous, rather than assumed to be given. In particular, Harstad (2008) considers a framework in which bidders' entry decisions are endogenous and finds that an auctioneer who is concerned with revenue deliberately chooses entry fees that will lead in expectation to some potential bidders refraining from participating in the auction.

In a somewhat similar vein, Lu (2008) considers the revenue-maximizing auction design when bidders have private values and must incur costs in order to determine their values for the object for auction. Lu proves that in implementing the optimal auction only pure-strategy entry rules need be considered. Moreover, it is shown that the optimal scheme must entail entry fees, rather than minimum bids.

Katzman and Rhodes-Kropf (2008) is a contribution in a relatively recent and growing literature that recognizes that auctions frequently are not transactions conducted in isolation. Thus, Katzman and Rhodes-Kropf consider an auction for the right to compete in a downstream market. Since different auction formats reveal different information about bids that are placed, the auction format in place allows distinct inferences to be drawn about a bidder's type in subsequent interactions. As this affects downstream competition, bidder behavior in the auction thus becomes subject to additional strategic considerations during the auction. Interestingly, Katzman and Rhodes-Kropf also show that the announcements made in different auction formats affect bidder participation decisions, although for different reasons than those presented in Harstad (2008) and Lu (2008).

In the paper by Damianov (2008), the total amount to be sold is determined only after bidding takes place. These so-called variable-supply auctions have become more prominent in recent years as they are widely used in the auctioning of treasury bills, but are also employed in initial public offering and, recently, in wholesale electricity markets. He shows that for the case of downward sloping demand and increasing marginal costs of supply, the discriminatory auction yields the Walrasian outcome, whereas in uniform price auctions lower prices may emerge. Abrams and Schwarz (2008), while also constituting a theoretical contribution, has an immediate applied focus in considering the auctions that are conducted for advertising space on sponsored search engines on the Internet. They note that customers' experiences in clicking on ads are likely to affect their propensity to click on ads in the future. Abrams and Schwarz present an auction mechanism that leads to efficiency by internalizing these effects, when advertisers impose hidden costs on others.

Two of the papers in the special edition—Milkman, Burns, Parkes, Barron and Tumer (2008) and Dechenaux and Marcini (2008)—use laboratory experiments in their research. Milkman et al. tackle the practical issue of how auction design can facilitate bidders in converging to equilibrium behavior. In particular, they contrast a standard second-price auction format with a so-called clamped second-price auction mechanism. The latter was specifically designed in order to facilitate learning by bidders, and it outperforms the standard second-price auction in simulations with agents who are reinforcement learners. However, Milkman et al. demonstrate that bidders in a standard second-price auction actually outperform those in the clamped auction in terms of convergence to equilibrium behavior. Dechenaux and Marcini (2008), the second experimental piece in the special issue, is an

example of research into other areas of economics that draw on results and insights from auction theory. In particular, using a model on litigation rules that is based on auction theory introduced by Baye, Kovenock and de Vries (2005), they examine how subjects react when faced with different litigation systems in civil suits.

The special issue concludes with two empirical papers: Bangwayo-Skeete (2008) and Brendstrup, Kuhn and Paarsch (2008). The former is a case study on the foreign exchange auctions reforms in Zimbabwe in 2004. Bangwayo-Skeete (2008) contains an overview of foreign exchange auctions, which are frequently used to allocate hard currencies in developing countries, and then discusses the particulars of the auctions used in Zimbabwe to disperse U.S. dollars. She finds that, unlike currency auctions in some comparison countries, Zimbabwe's auctions failed to stabilize currency markets largely due to poor institutional design and a lack of transparency tied to poor governance.

Brendstrup et al. (2008) is another example where research on auctions has been able to improve our understanding in areas not primarily thought of as auctions markets. Specifically, they consider a model of wage determination as a double auction and use structural estimation techniques originally developed in the auction literature in order to recover distributions of marginal productivities and opportunity costs. In applying the technique to examine data from Danish firms and workers, they find significant inefficiencies associated with informational asymmetries between firms and workers.

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