Part 1B  Afterword

Although auction theory has remained an extremely active area of research since this survey was written in 1999, an introductory survey written today would not be very different. The important changes would be in three areas: multi-unit auctions, collusion, and entry, in which much work has been stimulated by the practical concerns and experience arising from the many newly-created auction markets (especially the recent government auctions of mobile-phone licenses) that we will discuss in Parts III and IV.¹

There has been particular interest in multi-unit auctions of heterogeneous goods, especially in auctions in which there are complementarities between the goods. This work has yielded few definite answers about what mechanisms might be optimal (either revenue maximising, or socially most efficient), but much effort has focused on what might be practical auction designs.²

The most important new design is the Simultaneous Ascending Auction (SAA). This is a fairly natural extension to multiple objects of the basic ascending auction; the bidding remains open on all the objects until no-one wants to make any more bids on any object. Some complexity arises from the fact that a bidder may be reluctant to place bids until he sees other players’ bids, in order to learn others’ valuations. In particular, a

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¹ The increased attention to collusion and entry may perhaps have been reinforced by my urgings, in Klemperer, 1998, 1999, 2000.
² If there is no complementarity or substitutability between objects, i.e., a bidder’s valuation for a bundle of objects just equals the sum of his (private) valuations of the individual objects in the bundle, it is efficient to auction the objects separately, but it may nevertheless increase expected revenue to auction the objects in bundles, see Section 10.1 of our Survey. If no bidder is interested in more than one unit, and units are homogeneous, most standard auctions (whether simultaneous or sequential) are revenue equivalent, see Section 10.3 of the Survey.
bidders may be concerned about the risk of being ‘stranded’ winning an object that he had wanted to win only if he had won other objects which were in fact won by other bidders. So ‘activity’ rules that specify what bids a bidder must make to remain eligible to win objects are necessary to ensure that the bidding proceeds at a reasonable pace.

Although the germ of the SAA idea can perhaps be traced back to Vickrey (1976), it was first developed for practical use by Milgrom, Wilson and McAfee who proposed the rules that were necessary to make the SAA effective in the context of U.S. radiospectrum auctions. A full description of one version of the SAA is given in Section 5.2 of Part IVB. We also show in that Section that the SAA is, in theory, an efficient mechanism for the sale of heterogeneous objects when bidders have private values, but want (or are permitted) to win at most a single object each. However, the design has also been used in many other circumstances than these, and we will describe some of its successes and failures in practice in Sections III and IV.

One reason the SAA was originally proposed for the U.S. radiospectrum auctions was that it was thought it might work well when bidders have complementarities between objects, but this will not be true if the complementarities are sufficiently important. The reason is the one noted above that bidders are required (by the activity rules) to make firm bids on some objects before they know which other objects they will win. Some bidders may therefore end up stuck with objects that are worth very little to them because they failed to win complementary objects (this is called the exposure problem), while other bidders may quit the bidding early because of fear of this. Thus inefficiencies are likely. So if complementarities are important, it is natural to use some form of ‘combinatorial auction’ in which buyers place bids for packages of items and/or make

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3 The description given there is for a context in which bidders are permitted to win just one object each, so the activity rules are particularly simple.


5 If there is no penalty for withdrawing bids, the bidding process may never end, and there may also be substantially enhanced possibilities of collusion.
contingent bids. 6 (A package bid is a single price offered for a set of items; a contingent bid is one that applies only under specified circumstances such as the buyer winning a particular other object; these auctions are called “combinatorial” because the auctioneer must solve a combinatorial optimization problem).

The most famous combinatorial auction is the Vickrey auction, in the general version of which the auctioneer maximises social surplus and sets prices so that each participant’s net profits equal her contribution to social surplus, assuming participants bid truthfully (i.e., the participant pays a price for those items she wins equal to her declared value for those items less the total social surplus achieved by the allocation plus the social surplus that the auctioneer could have achieved if that participant had not been present). However, as noted in Section 10.4 of the Survey, a Vickrey auction is usually totally impracticable even in those private-value contexts in which it is, in theory, efficient. 7 There has therefore been considerable renewed interest in alternative combinatorial auction forms including Bernheim and Whinston’s (1986) first-price package auctions (in which bidders submit package bids, the seller selects the combination that maximises her revenue, and each bidder pays the amount it bid for the package it receives); ascending package auctions such as Banks, Ledyard and Porter’s (1989) “adaptive user selection mechanism” or AUSM (pronounced “awesome”, and developed – as can, of course, be inferred from its name – in California) in which bidders can raise their bids over a series of rounds; and Ausubel and Milgrom’s (2002) “ascending proxy auction”. Milgrom (2003) is an excellent introduction to the state of the art in combinatorial auctions, and to multi-unit auctions more generally.

6 Although combinatorial auctions can often reduce inefficiency, permitting or requiring bids for packages rather than individual objects can also sometimes result in bundling items that would be more efficiently allocated to different bidders – this may nevertheless increase seller revenue.

7 Policy makers usually find a Vickrey auction very hard to understand and operate; it often results in bidders with high values paying less for objects than bidders who win identical objects but have lower values for them (which seems strange and unfair to many people); it offers unusual opportunities for collusive behaviour which are also hard to guard against; and it sometimes yields low revenues. Furthermore, it is not efficient (and may perform very badly) if bidders are risk-averse or have budget constraints or have common-value elements to their valuations.
The practical use of multi-unit auctions has also reinforced the importance of the “demand reduction” problem we noted in Section 10.4 of our Survey, above, that bidders in these auctions, like oligopsonists in other kinds of markets, can often lower the prices they pay by buying fewer units than they actually want (because offering to buy fewer units means the auction closes at lower prices). This behaviour can arise even if there is just one “large” bidder who wants more than one unit, and if all bidders bid independently. When there are several “large” bidders, multi-unit auctions also open up the possibility of these bidders coordinating their behavior to reduce their demand in concert. Such “collusion”, whether tacit or otherwise, has been a serious problem in multi-unit auctions, especially in ascending designs such as the SAA, as we will emphasise in Sections IIIA and IVA.

Thus multi-unit auctions have focused renewed attention on the point made in Section 9 of our Survey, above, that “A crucial concern about auctions in practice is the ability of bidders to collude, but the theoretical work on this issue is rather limited”. Although the importance of this issue is now generally recognised, and research on it is beginning to develop, this literature remains in its infancy. In particular, as we will emphasise in Part IIIB, it is not clear that it has yet taught us very much more than could be gleaned from an intelligent reading of the industrial organization literature.

Finally, and also prompted by practical experience, there is a much greater general understanding than previously that, as emphasised in Section 8.1 of the Survey above, “In practical auction design, persuading bidders to take the time and trouble to enter the contest is a major concern”. Although no general principles have yet emerged beyond those in Section 7 (about asymmetries between bidders) or Section 8 (explicitly about entry) of the Survey, this issue is now an area of active research.

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8 This problem has been emphasised by Ausubel and Cramton (1998) and Ausubel (forthcoming) (the latter paper is a revision of the paper Ausubel (1998) referred to in the Survey).
We will give considerable attention to the problems of encouraging entry and discouraging collusion, often in the context of multi-unit auctions, in Parts III and IV of this Volume.¹⁰

References


¹⁰ Klemperer et al (forthcoming) is a case-study of a multi-unit auction of environmental goods that emphasises entry issues.


