

Vickrey Auctions Predate Vickrey

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Abstract

William Vickrey (1961) proposed an auction mechanism in which bidders submit sealed bids, and the highest bidder wins the good in return for payment of the second-highest bid amount. For decades, economists have credited Vickrey with inventing this auction format, and have believed that the Vickrey auction is rarely used in practice. This paper presents evidence that Vickrey auctions have long been the predominant auction format for mail sales of collectible postage stamps. Stamp auctioneers developed this auction format on their own, as early as 1893, even before Vickrey was born.

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Introduction: Vickrey Auctions in the Economics Literature

As part of his seminal work on auction theory in 1961, William Vickrey pointed out the existence of a sealed-bid auction mechanism which should produce equivalent results to the traditional English (or ascending-bid) auction. Vickrey's proposed mechanism sells the good to the highest bidder, with the price determined by the amount of the second-highest bid. Now frequently called the "Vickrey auction" by economists, this auction format is recognized as one of the earliest intellectual seeds of the field of mechanism design. In this paper, I show that, unbeknownst to most economists, a number of auctioneers have independently devised this auction format and understood its equivalence to the English oral auction. It turns out that sellers in the stamp collectors' market have been conducting Vickrey auctions since before Vickrey was born.

In his 1961 paper, Vickrey noted that the standard (first-price) sealed-bid auction was strategically equivalent to the Dutch declining-price auction. He then asked whether some sealed-bid procedure could be found to be equivalent to the English ascending-price auction. Vickrey wrote: "It is easily shown that the required procedure is to ask for bids on the understanding that the award will be made to the highest bidder, but on the basis of the price set by the second highest bidder." Nowhere did he indicate cognizance that this procedure had ever been used by auctioneers. By contrast, he discusses the English auction's use as a standard auction format, the Dutch auction's use in selling flowers in the Netherlands, and the first-price auction's use in selling real estate and securities. It seems that Vickrey was unaware of the second-price sealed-bid auctions already in use by 1961.

Other economists since Vickrey have also been unaware of the existence of second-price sealed-bid auctions in practice, as evidenced by the profession's crediting Vickrey with first proposing this auction format. Milgrom (1989) notes that "Vickrey observed that the outcome of the English auction could also be achieved by means of a sealed-bid auction with the following rules," and goes on to call this the "Vickrey second-bid auction." Cassady (1967), in an extensive survey of the various types of bidding procedures in practice, makes no mention of the second-price sealed-bid auction. McAfee and McMillan (1987) credit the second-price auction to Vickrey (1961), and note that "While this auction has useful theoretical properties, it is seldom used in practice." But it turns out that the Vickrey auction has not been used as seldom as previously thought. Several hundred auctioneers used the Vickrey auction as their primary method of business before Vickrey ever wrote his 1961 article.

I do not wish to detract from Vickrey's considerable contributions to economists' understanding of auctions. In his original article, Vickrey made a number of major contributions: deriving the Nash equilibrium for a first-price sealed-bid auction, demonstrating equivalence of expected revenue between first-price and English auctions, proposing the second-price auction as a mechanism strategically equivalent to the English auction.¹ It is only the last of these contributions that I address in this paper. Rather than criticizing Vickrey, I merely wish to set the record straight by giving credit to stamp auctioneers for attaining the same clever insight independently and earlier.

Rothkopf, Teisberg, and Kahn (1991), in discussing the scarcity of Vickrey auctions, presented perhaps the most complete description of Vickrey auctions to date in the economics literature. In making the case that Vickrey auctions are rare in practice, they found a few examples which are at least close to the Vickrey format: uniform-price auctions

¹ Apparently, Vickrey did not even consider his work on auctions to be very important. Richard Arnott (1998), who provides a survey of Vickrey's many contributions to applied economics, notes that Vickrey "perversely insisted that this paper was among his lesser contributions."

of Treasury bills and other securities, proposed auctions for electric power generation, and the auctions which are the topic of this paper: stamp auctions. They note that “In some auctions of collectible items such as stamps and autographs, the auction involves mailed-in sealed bids based on a catalog listing as well as oral bids,” and that winning mail bidders pay one bid increment higher than the second-highest bid received.² In fact, as I will demonstrate, many stamp auctions actually use the pure Vickrey format, accepting no oral bids whatsoever. Rothkopf *et al.* did not notice this pure use of the Vickrey format, nor the fact that it predates Vickrey. Like other authors, they credited Vickrey with inventing the format: “a sealed second-price procedure (now sometimes called ‘Vickrey auctions’) that he devised.”

This paper presents my research into the history of the Vickrey auction in the market for collectible stamps.³ The next section documents precursors leading to the evolution of the Vickrey auction. The third section documents full-fledged Vickrey auctions in the late 1800s and early 1900s, and describes the extent of their use. The fourth section speculates on the future of the Vickrey auction in practice, and a brief final section concludes.

Precursors to the Vickrey Auction: The Stamp Auctions of the 1870s

The first adhesive postage stamp (the “Penny Black”) appeared in England in 1840, and the hobby of stamp collecting first began in the 1850s.⁴ Stamps, like other collectibles (paintings, silver, ceramics), eventually represented fodder for auctions. The first 100 stamp auctions took place from 1870 to 1882, most of them in New York City. In the 1890s, such auctions became common, with over 2,000 auctions held worldwide by 1900.⁵

These auctions generally used conventional English auction rules. However, from the earliest years, accommodations were made to individuals who wished to bid on stamps without having to travel to the auction in person. The first auction catalogue of stamp dealer William P. Brown, New York City, 1878, reads as follows:

That out-of-town collectors may have equal facilities for purchasing with city collectors, bids may be sent to the auctioneers, Messrs. Bangs & Co., or to William Erving, P.O. Box 3222, N.Y. City, who will either of them represent their bids the same as though they were personally present, and without charge. Thus, supposing either of these parties receives two bids on one lot of 20 and 25 cents apiece, they would start the lot at 21 cents, at which price it would be given to the person sending the 25 cent order, unless some one present advanced, when they would continue to bid, stopping at the limit of 25 cents. Collectors can safely entrust these parties

² Thiel and Petry (1995) perform a test of common-value auction theory based on similar stamp auctions. They use an interesting and original data set of bids submitted by mail bidders in stamp auctions from 1923 to 1937. They characterize these auctions as “second-price,” recognizing the equivalence discussed in this paper, though their auctions include an English bidding floor in addition to the mail bids.

³ I took an interesting path to the discovery that Vickrey auctions predate Vickrey. In doing research on the state of the art in commercial Internet auctions, I came across a Web site for the company Antebellum Covers which advertised an auction by mail for Civil War memorabilia. I was intrigued to find that the auction used the second-price rule. I contacted the auctioneer to ask how he came to use this rule, and he told me that this was the standard procedure; it had been going on for years in the markets for paper collectibles (soldiers’ letters, etc.), and postage stamps.

⁴ The first United States postage stamp was issued in 1847.

⁵ Telephone conversation with Dr. Herbert A. Trenchard, September 1998.

with their bids as strictly confidential, and we trust they will find it more satisfactory than paying the usual dealers' commission of ten per cent for purchasing. Persons sending bids should give the number of the lots and the highest price they are willing to give, when the lot will be bought for them as low as possible consistent with the representation of other bids.

Quite a few other stamp auctions had offered a “mail bid” service, but charged a fee of ten percent to serve as the bidder’s agent on the auction floor. Brown appears to have waived this fee for the first time, with the intention of treating mail bidders exactly the same as floor bidders. This practice is common at many auction houses today, not just with stamps, but also in auctions of wine, art, and other collectibles. Clearly, this absentee bidding anticipates the Vickrey auction in both spirit and effect, as the above auction catalogue notes, because it results in the absent bidder’s price being determined by the second-highest bid.

The 1870s also saw the beginning of “mail sales” in the stamp market: sales with no floor bids, but only sealed bids submitted through the mail.⁶ The first such sales, held around 1877, were “tender sales,” or what economists today would call first-price sealed-bid auctions. Dr. Herbert A. Trenchard, who maintains one of the world’s most comprehensive collections of stamp auction catalogues, says that “Most of these early mail sales were held by stamp dealers in small towns, selling inexpensive stamps, and usually listed in the stamp journals of the time. The major stamp dealers were in the large cities, and they held conventional auctions.”⁷

Vickrey Auctions, 1893 to the Present

A Vickrey auction is a natural extension of the two precursors discussed above, both already present in the 1870s. There existed standard auctions allowing absentee bidders to submit maximum bid amounts, and awarding goods to winning absentee bids at the price of one increment over the second highest bid. There also existed sales which accepted only sealed bids. The Vickrey auction combines these two ideas: holding a sealed-bid-only sale, and awarding the good at the price of one bid increment over the second-highest bid.

Wainwright & Lewis, of Northampton, Massachusetts, held a Vickrey auction in 1893. This is the earliest Vickrey auction I have been able to identify. Their sale announcement, published in the stamp journal *Golden Star* in March 1893, reads as follows:

Catalogue of a Collection of U.S. and Foreign Stamps

To be sold WITHOUT RESERVE except where noted.

⁶ A note on usage: economists and practitioners differ in their usage of the term “auction.” During the course of this research, I interviewed a number of collectors and dealers in the stamp market, and everyone found it puzzling that I used the term “auction” to describe sealed-bid sales of stamps. Due to legal regulations, an “auction” (meaning an English auction with oral bids) can only be conducted by a licensed auctioneer, while a “mail sale” (assuming it avoids use of the term “auction”) is totally unregulated. Auction regulations vary from one state to another, but this distinction appears to hold in most areas. In the early years of stamp auctions, the stamp dealer who wrote up the catalogue (such as William P. Brown, above) was a separate entity from the auction house (such as Bangs & Co., above) hired to conduct the auction. Today, however, almost all stamp auctions are run by stamp dealers who have obtained their own auction licenses.

⁷ Letter from Dr. Herbert A. Trenchard, September 1998.

Bids will be received up to 4 P.M., May 15, 1893.

Bids are for the LOT, and, contrary to the usual custom in sales of this kind, we shall make this a genuine AUCTION sale; that is to say, each lot will be sold at an advance of from 1c to 10c above the second highest bidder. Address all bids to

Wainwright & Lewis, Northampton, Mass.

The phrase “an advance of from 1c to 10c above the second highest bidder” indicates that the final price would be one minimum bid increment above the second-highest bid. In calling this a “genuine AUCTION sale,” Wainwright & Lewis are indicating their recognition that “selling at one advance over the second highest bid” is the key feature of a standard English auction (as contrasted with the “usual” sealed-bid sale, which used a first-price rule). This is the same insight as Vickrey’s.

Wainwright & Lewis appear to have held no further auctions, but the same concept was to be used again by others. In 1897, William P. Brown of New York became the first major stamp dealer to hold a Vickrey auction, with his Auction Sale No. 2. (As we have already seen, his first auction sale in 1878 was the first stamp auction to offer no-fee mail bids. He was a pioneering stamp dealer.) The sale catalogue has a bidding deadline of March 6, 1897. Its Terms of Sale describe the public reserve prices used in the auction (referred to as the dealer’s own offer to buy), the minimum bid increments (5 cents for bids under \$1, 10 cents for bids from \$1 to \$5, and so on), shipping arrangements, and the following description of the pricing rule:

These goods are not sold publicly to those who come in person, but to those who send or hand us their offers, which are confidential until after the sale. The highest offer secures the purchase.

... At the time appointed for the sale all the offers received will be examined and awarded to the highest competitor. For instance we will suppose lot No 2006 has on it our offer of \$1.50; and we find three others, one for \$1.60, one for \$2, and one for \$10.00. The \$10. offer receives it for \$2.10, which is the lowest price at which he could obtain it if all the competitors were present.

The Vickrey auction format spread slowly to other stamp dealers. Several companies established long-running businesses based on Vickrey-style “mail sales,” including B.L. Voorhees of Blue Island, Illinois (starting with Sale 7 in 1906); Western Stamp Co. of Omaha, Nebraska (starting with Sale 15 in 1907); Toledo Stamp Company of Toledo, Ohio (starting with Sale 15 in 1907); The Postage Stamp Company of San Francisco, California (starting with Sale 1 in 1913); and Henry Wendt of Earlville, Iowa (starting with Sale 142 in 1920). Most of these companies started out with first-price sealed-bid auction rules, switching to second-price rules at the dates indicated.

Through 1920, “mail sales” remained small relative to the conventional English auction business in stamps, in terms of both price and quantity. Of the mail sales, Vickrey auctions remained less common than first-price sealed-bid auctions. Some of the Vickrey-style auctioneers took great care to explain the benefits of their auction format to their bidders. Toledo Stamp Company, for example, wrote in its 15th Mail Auction Sale catalog in 1907:

To those who have never bid on Auction Sales before we wish to say that this is one of the best ways to add to your collection stamps that you would not be able to purchase at the price otherwise. You say just how much you wish to pay for a lot, and if no one else has overbid you, you get the stamps. If your bid is too high we buy for you at a small advance over the next highest bid, so you are protected in any case.

The 1930s, however, saw mail sales become larger and more frequent relative to English auctions. Some traditional stamp auction houses began to run their own mail sales in parallel with conventional auctions. For example, Y. Souren Co. announced its “First Mail Sale” in a catalog dated 1936, and Max Pool announced its “New System Mail Sale No. 1” in 1940. Both used the Vickrey second-price rule.

In fact, from the 1930s to the present, the majority of mail sales of stamps have used the Vickrey second-price rule. The rule became so standard that it no longer had to be explained. For example, in 1935 the Belmont Stamp Company of Dallas, Texas (appropriately enough, located on “Vickery (*sic*) Blvd.”!) stated the rule in its First Mail Auction as follows: “All lots will be sold to the highest bidder at a slight advance over the next highest bid.” Nearly identical language can be found in numerous other mail-sale catalogs from the 1930s to the present. Often, the price rule is even less explicitly stated. For example, several catalogs tell the bidder that “in submitting your bids, you understand that we will purchase the items for you at the lowest price possible.”

On the basis of his collection of stamp sale catalogues, Dr. Trenchard estimates that at least several hundred different stamp companies ran second-price auctions by mail prior to the publication of Vickrey’s paper in 1961. It is worth noting that the stamp auctioneers and Vickrey both devised the second-price auction to be equivalent to the English auction, even though they had slightly different motivations for doing so. Vickrey pointed out, especially in a second paper (1962), that the second-price auction involves a dominant strategy for each bidder to bid his own valuation, the first example of a dominant-strategy revelation mechanism. By contrast, the stamp auctioneers had a profit motive: running a second-price sealed-bid auction allowed them to replicate the outcome of a standard ascending-bid auction, but in a way that would allow them to lower costs (by eliminating the bidding floor) while raising revenues (by inducing more bidders to participate from rural areas). These different motivations both led to the same solution: the second-price sealed-bid auction.

The Future of the Vickrey Auction

Although the Vickrey auction format is prominent in the stamp business, Rothkopf *et al.* (1991) believe that it is rare in the economy overall. They propose two explanations for the scarcity of Vickrey auctions: (1) bidders may fear truthful revelation of information to third parties with whom they will interact after the auction, and (2) bidders may fear auctioneer cheating. They present a formal model of the first of these two reasons, while Rothkopf and Harstad (1995) model the second.

In the course of my research for this paper, I have discovered several pieces of direct evidence that reason (2) is indeed a real factor: bidders do fear auctioneer cheating in second-price auctions. Once you have submitted your maximum willingness to pay, the auctioneer has an incentive to cheat, and pretend that he received another bid just under your maximum amount.

Dr. Trenchard, a longtime participant in stamp auctions and mail sales, indicates that he is reluctant to reveal his true willingness to pay in a Vickrey auction. “Unless I have confidence in the company,” he writes, “I will not send any mail bids. And it’s risky to send an outlandishly high mail bid, because you alert [the auctioneer] to information you don’t want him to have. For mail sales, I try to make more conservative bids.”⁸ He expresses the same wariness of mail bids sent to an auctioneer for a floor auction: “Never send a mail bid to an auctioneer. If you give him an outlandish bid, he’ll wonder why, look at the lot and perhaps discover what I know that he didn’t know. He can then withdraw it!”

Auction agents at English auctions provide a potential solution to this problem. When a bidder can’t attend an auction in person, she can instead choose to hire an agent to represent her. She tells the agent her maximum willingness to pay, and he raises the bids on her behalf up to her maximum willingness to pay. This prevents the auctioneer from knowing information that would allow him to cheat. In the stamp market, agents usually charge a 1% to 5% commission on the purchase, which does give the agent some financial incentive to want to submit higher bids, but this incentive is small compared with the lost future business that would be associated with a damaged reputation as an untrustworthy agent. (For comparison, the auctioneer’s revenue in a consignment auction is typically around 25% of the sale price, including both buyer’s and seller’s fees. Frequently, the auctioneer may own the stamp himself, in which case he earns 100% of any increase in the auction price.)

Jeff Purser, of Purser Associates in Connecticut, is an auction agent who used to be a stamp auctioneer. In the 1980s, his auction company ran public auctions and mail sales for stamps. He has firsthand experience with the incentives for auctioneer cheating in Vickrey auctions:

I swore I would never do many of the things I'd seen other auctioneers do as far as how they handled mail bids. My terms of sale were the same as all the others when it came to this issue. I assured prospective bidders they could bid with confidence since all mail bids “would be reduced to one advance over the next highest bid.” And in the beginning, that is what we did. But I found there are inherent conflicts of interest every auctioneer must deal with in his role as agent for both the consignors and the bidders, and I'm ashamed to admit I did not handle those conflicts very well. Looking back, I learned the mind is amazingly creative when it comes to rationalizing bad behavior.

After some time in the business, I ran an auction with some high mail bids from an elderly gentleman who'd been a good customer of ours and obviously trusted us. My wife Melissa, who ran the business with me, stormed into my office the day after the sale, upset that I'd used his full bid on every lot, even when it was considerably higher than the second-highest bid. She threw his invoice on my desk and said, “I thought we weren't going to do this crap!” I glanced at the paperwork and without even thinking about it, said, “I don't like having to do this, honey, but you know our bank loan is due tomorrow.” After some thought, she said, “Okay, I'll do this, but only if you agree to change the rules in our next auction to read, ‘All lots are sold to the highest mail bidder at one advance over the

⁸ Note that Trenchard’s conservatism in sealed-bid versus English auctions appears to stem not from standard “winner’s-curse” arguments in auction theory, but rather from a fear that the auctioneer can’t be trusted. See Milgrom (1989) for a discussion of the winner’s curse, which stems from bidders’ private uncertainty about their valuation of the good.

second highest bid, unless we need the money.’ With that one sentence she stripped me of all my rationalizations and excuses. She held a mirror up to my conduct and I hated what I saw. I had no choice but to recalculate all our invoices for that sale to conform with our rules. That’s when I decided to leave the business of running auctions.⁹

These anecdotes support Rothkopf and Harstad’s (1995) model of Vickrey auctions. Bidders fear complete revelation to the auctioneer, because the auctioneer might inflate his reported second-highest bid, or because the auctioneer might withdraw the good from the market if he receives a high bid which signals that the good is more valuable than he originally thought. If bidders fear revelation, then they will bid more conservatively, and therefore an honest Vickrey auctioneer will make less revenue than he would in an English auction, where the fear of cheating would be absent.¹⁰

But the Vickrey auction format may still have a future. Vickrey-like features have been appearing in auctions on the Internet, a rapidly growing sector of auction business. Most Internet-based auctions involve English ascending bids, but several have begun to offer a feature called “proxy bidding,” a system similar to traditional auctioneers’ practice of accepting absentee bids by mail. Proxy bids allow a bidder to indicate her maximum willingness to pay for a good, with the site only raising her bid to the point where it just exceeds the next-highest bid. They are offered as a convenience: when a bidder uses a high proxy bid, she doesn’t have to check back to the site to raise her bids so often over the auction period of several days.

The largest auction site on the Internet, eBay, auctions approximately \$70 million in goods per month as of September 1998. They explain their proxy bidding in colorful language, to illustrate the potential benefits to bidders: “instead of having everyone sit in front of their computers for days on end waiting for an auction to end, we do it a little differently. Everyone has a little magical elf (aka proxy) to bid for them and all you need to do is tell your elf the most you want to spend for that item and he’ll sit there and outbid other elves for you, until his limit is reached.”

Internet auctioneers like eBay sell items for a commission of 5% or less, so their incentives to cheat are relatively low by comparison with traditional auctioneers (who would earn 25% to 100% of any run-up in the bid). Further, they have very many customers who have on-line access to the results of each auction. So I believe there is cause for optimism that third-party auctioneers in future will be able to implement Vickrey rules without bidder fear of cheating. When the auctioneer is a third party who earns only a small fraction of the amount of a bid increase, his incentives to maintain a reputation for running a fair and convenient bidding system for hundreds of thousands of customers may outweigh the incentives to cheat, and customers may realize this.¹¹

⁹ Email message from Jeff Purser, September 1998, who gave me permission to attribute the quote to him.

¹⁰ Even in an English auction, there some potential for auctioneer cheating. When only one bidder is left, auctioneers have sometimes been known to invent a “phantom bidder” or “take bids off the chandelier,” in order to drive up the price. On the other hand, this form of cheating is more difficult. A sealed-bid auctioneer can do his cheating in private, where the auctioneer can pretend to have as many other sealed bid as he wants, while an English auctioneer must do his cheating in full view of the bidders.

¹¹ A personal anecdote gives evidence consistent with the hypothesis of no cheating at eBay. In May 1998, I placed a proxy bid of \$800 for a piece of used computer software at eBay, which resulted in my winning the auction at a price of only \$550. The seller of the good never learned from eBay that I was willing to pay up to \$800. A cheating system, of course, might have resulted in a price much closer to \$800.

Summary

In this paper, I have endeavored to correct a misconception about the second-price sealed bid auction: this auction format's use in practice predates its proposal by Vickrey in the economics literature. Although Vickrey was the first economist to point out the Vickrey auction's equivalence to the conventional English auction, stamp auctioneers made the same discovery at least sixty-five years earlier. I have also uncovered anecdotal evidence that fear of auctioneer cheating may be a serious influence in Vickrey auctions, as modeled by Rothkopf and Harstad (1995) in an attempt to explain the rarity of this auction format in the economy. Finally, I provide an argument that Internet auctioneers may be able to develop reputations for running Vickrey-style auctions without cheating, thus providing auctions with increased convenience for bidders.

This paper also raises some interesting questions. Because historical Vickrey auctions for stamps went undiscovered for so long, is it possible that Vickrey auctions also have existed for a long time in other markets?¹² Is it possible to find data to provide statistical support of my anecdotal evidence of auctioneer cheating in Vickrey auctions, or to determine whether bidders systematically reduce their mail bids as a result of fear of cheating? Finally, both traditional stamp auctions and new Internet auctions may yield interesting data on the following question: Which auction format generates more revenue *in practice* for an honest auctioneer: a Vickrey auction, or an English auction?

It is possible that the second-highest bidder might have submitted a bid considerably less than \$550, so that cheating might present without being total. However, eBay publishes a Web page with a list of the losing bidders, their maximum bids, and their email addresses, thus providing a potential verification system (assuming that the auction site does not hire an army of confederates to serve as losing bidders, which would seem relatively difficult to maintain).

¹² Perhaps auctions for stamps and collectible paper are unique, in that these goods are relatively easily described in words and pictures, and relatively inexpensive to ship. Sealed-bid auctions may not have been so feasible for goods (such as antique furniture) which bidders would need to inspect the goods in advance, and/or where shipping was difficult. Overnight shipping is now possible for many types of goods, but was not so common during the 1930s, when Vickrey auctions for stamps became popular.

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