

The CPI Antitrust Journal

July 2010 (2)

Sponsored Search Auctions: Simple Economics and Implications for Antitrust Policy

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I. INTRODUCTION

The most valuable asset of many two-sided platforms is their user base. In a celebrated example, Internet search engines (such as Google, Yahoo! or Bing) derive most of their revenue from selling the eyeballs of millions of searchers to advertisers. For each query entered by searchers, search engines return a list of sponsored links displayed to the right of the algorithmic (also called *organic*) search results. The knowledge of what searchers are looking for enables search engines to create very precise matches between searchers and advertisers.²

The ability to target consumers has great value to advertisers. The average price of a click on a sponsored link from Google in 2006 was \$2.00 and, for certain keywords, a click may cost more than \$100. On aggregate, keyword advertising has impressive figures: in 2007, the U.S. search traffic totaled more than eighty billion queries, of which 40 percent have commercial potential. The total revenue generated by keyword advertising alone amounted to more than 20 billion dollars in 2007.³

Recently, the three major search engines announced plans to collaborate in search technology and advertising. In June 2008, Google and Yahoo! issued a proposal according to which Google would deliver ads next to Yahoo's search results.⁴ In July 2009, Microsoft and Yahoo! announced a deal to share search technology and to join forces in search-generated advertising.⁵ The Department of Justice raised concerns about the anticompetitive effects of such partnerships, which were ultimately aborted. Still, the prospect of future mergers brings many new questions to the antitrust debate in online advertising. Would a merger between the leading search engines be beneficial to searchers or advertisers? How would market conditions affect the pricing and the selection of sponsored search ads?

Search engines have traditionally employed auctions to sell sponsored links to advertisers. The use of auctions in two-sided markets is a novel phenomenon, and its antitrust implications have no parallel in one-sided settings. In this short note, I review the simple economics of sponsored search auctions, and describe its main insights for antitrust policy. Surprisingly, concentrated markets can be welfare-improving when search engines are not able to subsidize (or charge) searchers for their clicking behavior.

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² See D. Evans, *The Online Advertising Industry: Economics, Evolution, and Privacy*, 23(3) J. ECON. PERSPECTIVES (2009).

³ See Bear Stearns, *Not Out of the Woods But a Step in the Right Direction* (2007).

⁴ See

http://www.nytimes.com/2008/06/13/technology/13yahoo.html?_r=1&scp=1&sq=google%20yahoo%20june%202008&st=cse

⁵ See http://topics.nytimes.com/top/news/business/companies/yahoo_inc/yahoo-microsoft-deal/index.html?scp=3&sq=google%20yahoo%20agreement&st=cse

II. KEYWORD AUCTIONS: PAST AND PRESENT

Overture Services (formerly GoTo.com), acquired by Yahoo! in 2003, pioneered the use of auctions to sell sponsored search advertising. The auction rules followed by Overture have two important features: first, advertisers pay on a *per click* basis. Payments per click have the advantage that advertisers are only charged for those searchers who were actually exposed to their ad. Arguably, this design reduced uncertainty on the advertiser side and was important to attract advertisers at a time when the effectiveness of sponsored advertising was far from established. Charging per click is still the practice in the sponsored advertising business.

Second, Overture adopted a pay-your-bid design, following an auction known as the generalized first-price (“GFP”) auction. In the GFP, each advertiser is asked to submit one bid that represents his willingness to pay for a click on his link. Advertisers are then assigned to sponsored links in decreasing order of bid values, and pay their own bid for each click received.

As time elapsed, Yahoo! discovered one important drawback of the GFP: Because of its pay-your-bid design, every advertiser has the incentive to reduce his bid until it matches the bid of the next advertiser. By doing this, advertisers can reduce payments per click while still maintaining the same position in the sponsored list. This feature led to price wars among advertisers and pushed Yahoo! to change its auction rules.

In 2004, Yahoo! moved to a pay-the-next-bid design. In the so-called generalized second-price (“GSP”) auction, each advertiser pays the next lowest bid for each click received (that is, the bid submitted by the advertiser immediately below him). This new design eliminated the perverse incentives for frequent bid updating, and is still followed by the major search engines.

In 2007, Yahoo! undertook another major change in its auction format. It moved to a new version of the GSP in which the bid submitted by each advertiser is combined with a *relevance (or quality) measure* to generate the advertiser’s *score*. Advertisers are assigned to sponsored links in decreasing order of their scores. Payments are still determined in a second-price fashion; each advertiser pays the minimum bid that is necessary to secure his position for each click.

The other major search engines followed a path similar to Yahoo!’s: Google moved to a scored version of the GSP already in 2005, and Microsoft’s LiveSearch (Bing’s predecessor) did the same in 2006.

As I argue next, the recent developments in the design of keyword auctions reflects the understanding that sponsored search advertising is a two-sided business.

III. SELLING THE EYEBALLS OF SEARCHERS: AUCTIONS IN TWO-SIDED MARKETS

Auctioning searches is fundamentally different from selling standard commodities (timber or paintings, for example). As is typical in many two-sided markets, search engines have to internalize the cross-side externalities between searchers and advertisers. On the one hand, searchers are more likely to click on sponsored links, as they perceive that search engines select advertisers based on their relevance rather than on their bids. On the other hand, total payments from advertisers increase as more searchers click on sponsored links. However, the advertisers who are more relevant to searchers do not usually coincide with those whose willingness to pay for clicks is higher. Finding the selling procedure that resolves this conflict was essential to the recent success of the keyword advertising business.

Recent theoretical work in economics confirms what search engines came to discover over the last few years: The selling procedure that maximizes profits in a two-sided market takes the form of a *scoring auction*.⁶

The fundamental ingredient of a scoring auction (such as the scored version of the GSP) is that advertisers are selected based not only on their bids, but also on their relevance. The weight that search engines put on the advertisers' relevance ensures that sponsored links enjoy a good reputation with searchers (in the two-sided markets parlance, it assures that the searcher side is on board). In turn, the weight given to bids makes sure that search engines are able to extract rents from the advertiser side of the market.

IV. PAYING FOR ATTENTION: SUBSIDIES TO SEARCHERS

Search engines have recently employed novel ways to increase the click-through rate of sponsored links. Starting in 2008, Microsoft established a cash back program that returns to searchers a fraction of the price of certain goods purchased through sponsored links. Microsoft also launched a loyalty program that rewards the searchers who click most on sponsored links with free software, video games, and more. In turn, Yahoo! offers prizes to individuals who download its toolbar. All these programs work as subsidies to searchers who click on sponsored links.

In what keywords should we expect search engines to subsidize searchers? And, if charges are once possible, in what keywords should search engines charge searchers for their clicks?

In recent work, I show that if, for a given keyword, advertisers benefit more than searchers from being displayed as a sponsored link, then the search engine should follow a loss leader strategy.⁷ Such a strategy works as follows: the search engine subsidizes searchers in order to boost the click-through rate of sponsored links, and recoups losses from the advertiser side of the market.

In turn, if the benefit to searchers is greater than the expected profit of advertisers, the search engine would like to charge searchers for their clicks! Up to date, search engines have never attempted to implement charges to searchers. Privacy concerns and the high transaction costs involved in micropayments are two important reasons why searchers are never charged.

Still, one important question remains: How do subsidies to searchers affect the scoring auction used to select advertisers? When subsidies are unavailable or unfeasible, the selection of advertisers is the only tool that search engines can deploy to attract searchers and extract rents from advertisers. In this setting, search engines have to modify their scoring auction to put more weight on the relevance of advertisers (relative to their bids) as a way to compensate for the lack of subsidies to searchers. Conversely, the lack of charges to searchers may explain why in certain keywords the scored version of the GSP gives so much weight to the advertisers' bids (relative to their relevance). Whether the search engine would like to charge or subsidize searchers in a particular keyword, the lesson here is that the selection of advertisers works as a substitute for monetary transfers to searchers.

⁶ For a formal analysis of auctions in two-sided markets, see R. Gomes, *Mechanism Design in Two-Sided Markets: Auctioning Users*, available online at <http://sites.google.com/site/northwesternrenatogomes/Home/research>.

⁷ *Supra* note 5.

V. IMPLICATIONS FOR ANTITRUST POLICY

What are the potential implications of a merger between the sponsored search businesses of two major search engines (let's say, Microsoft's Bing and Yahoo!)? Is the selection of sponsored ads affected by market conditions? Do searchers benefit from a more competitive sponsored search industry? How does competition affect the total welfare of searchers and advertisers?

Industry estimates suggest that a very large percentage of searchers use a single search engine.⁸ In the language of two-sided markets, searchers tend to single-home. In turn, advertisers usually spend their budgets in many different platforms, that is, they multi-home across search engines. As a result, the competition among search engines is fiercer in the searcher side of the market.

As a first approximation, let's consider a world in which subsidies (or charges) to searchers who click on sponsored links are not feasible. In this case, the selection of advertisers is the only instrument that search engines can deploy to compete for searchers. As a result, competition induces the search engines to modify their scoring auctions to put more weight on the relevance of advertisers relative to their bids. In other words, competition between search engines introduces a bias in the scoring auction that favors the searcher side of the market.

Although searchers obviously benefit from facing more relevant advertisers, the overall effect of competition on welfare is ambiguous. The reason is that the advertisers who are selected to the sponsored list have, on average, lower willingness to pay for clicks. As a result, the total value of a sponsored link (including for both searchers and advertisers) might well decrease as the sponsored search market becomes more competitive.

This conclusion is sensitive to the assumption that search engines are not able to charge or subsidize searchers. When transfers to searchers are possible, search engines compete for searchers by increasing subsidies, and the selection of advertisers is not affected by competition. In this world, competition unambiguously increases welfare, as the reduction in market power works to increase the population of searchers who click on sponsored links.

Still, it is a far cry to say that search engines can freely charge or subsidize the searcher side of the market. For one issue, subsidies that reward searchers by their clicking behavior are plagued by obvious moral hazard problems. Moreover, charging searchers may be difficult due to the transaction costs involved in implementing micropayments.

In conclusion, the welfare consequences of competition on the sponsored search industry critically depends on the ability that search engines have to make transfers to the searcher side of the market. In this regard, the antitrust authorities should exercise caution in applying standard antitrust economics to this two-sided industry. In particular, a monopolistic market may be efficient provided that search engines have limited ability to charge/subsidize the searcher side of the market.

⁸ See D. Evans, *The Economics of the Online Advertising Industry*, 7(3) REV. OF NETWORK ECON. (2008).