Impact of Rebroadcasters on Online Display Advertising Auctions

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Preliminary and incomplete:
comments welcome

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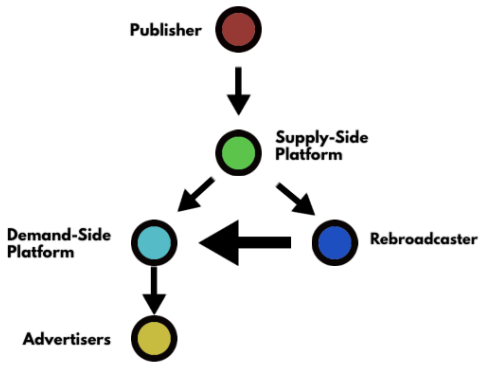
Abstract

An important revenue stream for many online businesses across the world is online advertising; websites attract consumers to their online content, and then sell ads on that content to other businesses who are looking to advertise their products. One of the fastest growing methods for facilitating the buying and selling of ads is 'real-time bidding' (RTB). As opposed to selling ads in bulk, an algorithmic auction is held where various companies submit bids, and the highest bidder wins the right to have their advertisement served to the consumer. A key component of these auctions are companies known as rebroadcasters: they receive bid requests in these auctions, but do not directly bid on the ad opportunity. Instead, they use their own technologies to send an updated bid request to advertisers, allowing them to potentially bid twice in the same auction. This paper explores the presence and effect of such rebroadcasters on the market dynamics of the Yahoo! exchange.

1 Introduction

There are five major players in these auctions: publishers, supply-side platforms (SSP), demand-side platforms (DSP), rebroadcasters and advertisers. The relationship between each of these company archetypes is best represented by the image below:



The online ad auction process starts with a user accessing some piece of online content from on an online publisher, whether that be a website, youtube video or perhaps an app. Suppose we take

the example of a commercial website as a publisher. When the user visits a website, there will almost certainly be space on the website interface that is unused by the publisher: in this space 'banners' may be placed by advertisers. Therefore, the relationship between the five major players above explains how exactly the publisher and advertiser conduct an exchange of services. First, the publisher sends an ad request to a SSP: such platforms handle ad requests by conducting a first-price sealed-bid auction. To conduct the auction, the SSP will send a bid request to many DSPs and rebroadcasters; these bid requests contain characteristic information about the ad request and the user, including the bcookie, website, adsize, geography, time etc. DSPs are companies that act on the behalf of many different advertisers. When DSPs receive a bid request they hold an internal auction, where the DSP determines the bid of each advertiser according to a multitude of factors, such as the advertisers budget and the estimated probability that the particular user will engage with the ad, etc. Rebroadcasters, however, do not directly represent advertisers: they instead represent DSPs. When a rebroadcaster receives a bid request, they send out a slightly modified bid request to DSPs; this means that the DSPs will receive a direct bid request from the SSP exchange, and a modified bid request from rebroadcasters. This modified bid request will theoretically contain more specific information about the ad request, as rebroadcasters attempt to use 3rd party cookies and other methodologies to provide more information to DSPs. When the rebroadcasters receive the bids from DSPs, an internal auction is held, where the highest bid (minus some transaction cost) is then submitted to the SSP exchange. The highest bid between the DSPs and rebroadcasters wins the main SSP auction, with the corresponding advertiser then being able to advertise on the publisher's website.

2 Project Motivations

Understanding the complicated process above allows for a discussion on the key focus of this project: understanding the role of rebroadcasters in the Yahoo! exchange. Currently, rebroadcasters play a major role in the Yahoo exchange, making up a significant chunk of the revenue from their ad auctions. Our macro level goal is to estimate what the added value of rebroadcasters is: for example, why do they win so many auctions, do they add information above and beyond what is contained in the SSP bid request? The effect of these rebroadcasters is unclear, due to the fact that rebroadcasters have several channels by which they may affect auction revenue.

As discussed in [5], the key feature that differentiates online advertising from traditional forms of advertisement is the increased targeting capabilities due to the nature of widespread access to detailed user data. Theoretically, rebroadcasters are thought to add more specific information about ad opportunities, above and beyond what is provided in direct bid requests, to DSPs. Then, as defined in [4], there is a concern that the fine-level of targeting provided by rebroadcasters may lead to 'cherry picking' and/or 'thin markets'. Cherry picking may occur when advertisers are not given very coarse or representative advertising opportunities; advertisers know that they are being sold poor advertising opportunities at least some of the time. A poor advertising opportunity might correspond to a weak fit between an advertiser and the end user viewing the ad. If advertisers are able to discern between the two opportunities due to extra info provided by rebroadcasters, they might invest a lot of time/resources into 'cherry picking' only the good opportunities, leading to lower overall market participation due to higher transaction costs. This is also related to the concept of 'thin markets', where granular differentiation of ad

opportunities might lead to pockets of the overall market that very few advertisers are interested in. As a result, very few advertisers would bid in those auctions, creating 'thin markets' where competition (and therefore bid pricing) is very low. Both of these phenomenon may lead to lower total revenue as a result of rebroadcasters.
Another key interest of this project is the degree to which DSPs can identify bid requests corresponding to the same auction from the Yahoo! exchange and rebroadcasters, and the potential impacts of such identification. For example, it is assumed that rebroadcasters typically provide more characteristic information about bid requests. It may be possible that because DSPs prefer this greater amount of information (it helps make the ad more effective, as DSPs make their money by taking a cut of ad performance) they prefer to win auctions through bid requests from rebroadcasters. This may result in intentionally lower direct bids to the Yahoo! exchange, as those bids come first. In line with the literature, we may describe these DSPs as 'colluding' DSPs. This is a mechanism by which rebroadcaster activity may result in lower total revenue overall for Yahoo!, as the bids by DSPs become more targeted/efficient.
Although the previous channels seem to imply that rebroadcasters might likely have a negative effect on total revenue, there are clear channels through which rebroadcasters work to enrich the Yahoo! exchange. For example, if DSPs are unable to identify that direct and indirect bids from Yahoo! exchange and rebroadcasters correspond to the same auction, then the effect of them submitting multiple bids is actually just increased competition for auctions, as the number of unique bidders in the auction has effectively increased. Increased competition would then clearly lead to higher total revenues, as winning bids would be pushed up in price. Additionally, as rebroadcasters are thought to provide increased targeting for advertisers, this may allow advertisers to spend more on each bid, as the expected revenue of each ad from an advertiser perspective would go up. This would increased average bid price, and therefore the winning bid would also be higher, again pushing up Yahoo! exchange revenues.
By inspecting the data, we hope to find evidence that lends clarification to which of the above channels dominate the way rebroadcasters influence the market.

3 Existing Literature

Work-in-progress (there doesn't appear to be any direct literature on the influence of rebroadcasters).

3.1 Data Description

This projects uses bidding data from display advertising ad auctions for ad opportunities on various Yahoo!-owned websites. These ad opportunities are a mix of banner ads, video ads, text ads and ads on various Yahoo! associated websites. Our sample contains auction data from a single day in March 2021.

4 Relevant Preliminary Empirical Findings

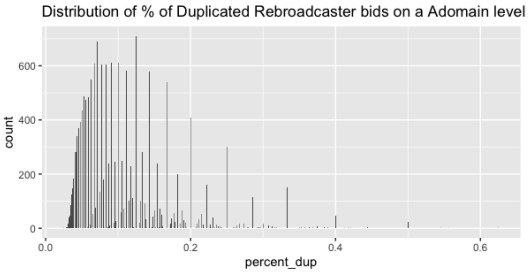
4.1 Statistical Findings

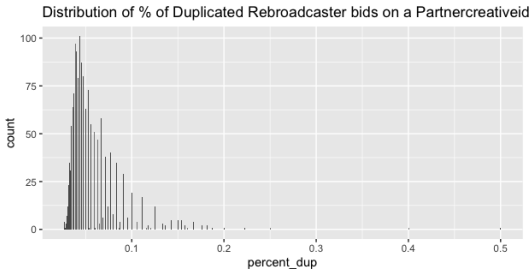
- The % of auctions with at least 2 bids sharing the same partnercreativeid is 4.96%.

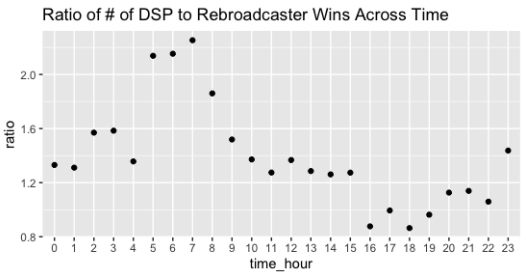
- The % of auctions with at least 1 bid from a Rebroadcaster is 92.99
- 100% of the auctions with at least 2 bids sharing the same partnercreative have a bid from a Rebroadcaster.
- This contrast points to something very interesting - it appears that in approximately 87.94% of auctions, some DSPs use a Rebroadcaster AND do not directly submit their own bid for the same ad.
- It appears that the same advertiser is not really submitting the SAME ad banner through multiple means in most of the auctions. Therefore, Rebroadcasters do not generally present an opportunity to bid twice on the same banner ad.
- The % of auctions with at least 2 bids containing the same addomain is 49.91%.
- In 82.73% of the above auctions at least 1 of the duplicated bids with the same addomain is coming from a Rebroadcaster.
- Rebroadcasters contribute 33.58% of the overall auction revenue.
- Rebroadcasters contribute 41.08% of the revenue in auctions with a duplicated partnercreativeid in bids.
- Rebroadcasters contribute 36.05% of the revenue in auctions with a duplicated adomain in bid.
- Rebroadcasters win auctions 41.63% of the time.
- Rebroadcasters win auctions where there are duplicated partnercreativeids in bids 41.08% of the time.
- Rebroadcasters win auctions where there are duplicated domains in bids 36.05% of the time.
- Only 0.54% of auctions won by Rebroadcasters have the winning Rebroadcaster bid have a duplicate partnercreativeid.
- Only 7.03% of auctions won by Rebroadcasters have the winning Rebroadcaster bid have a duplicate adomain.
- Overwhelmingly, (93%) when Rebroadcasters win auctions the DSP they serve didn't submit a bid in any way on behalf of the advertiser.

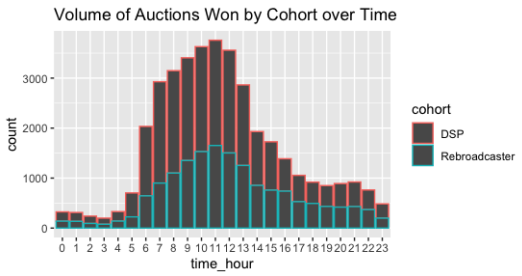
4.2 Visualizations

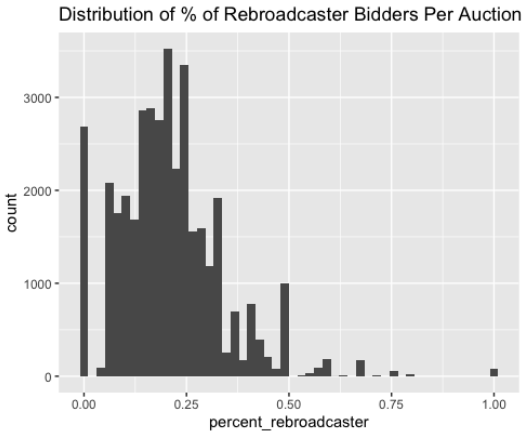
Characteristic	DSP Won Auctions	Rebroadcaster Won Auctions
Average Winning Bid	2.98, 95% CI [2.90, 3.05]	2.11, 95% CI [2.04, 2.18]
Average Number of Bids	14.96, 95% CI [14.87, 15.04]	13.98, 95% CI [13.87, 14.09]
Average Match Prop Value	57.96%, 95% CI [57.42%, 58.49%]	54.69%, 95% CI [54.02%, 55.36%]

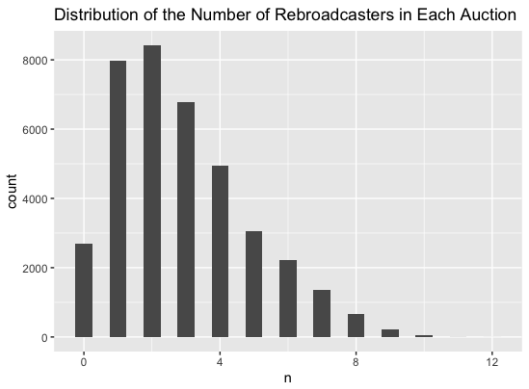

Distribution of % of Duplicated Rebroadcaster bids on a Adomain level
count
percent_dup


Distribution of % of Duplicated Rebroadcaster bids on a Partnercreativeid
count
percent_dup


Ratio of # of DSP to Rebroadcaster Wins Across Time
ratio
time_hour


Volume of Auctions Won by Cohort over Time
count
time_hour
cohort
DSP
Rebroadcaster


Distribution of % of Rebroadcaster Bidders Per Auction
count
percent_rebroadcaster


Distribution of the Number of Rebroadcasters in Each Auction
count
n

5 Preliminary Conclusions

- Rebroadcasters do not often submit multiple bids for the same banner ad. Rebroadcasters far more often main submit a different banner ad for the same company given extra info.
- In either case however, the average bid submitted by Rebroadcasters is not very likely to be higher than the bid submitted by the DSP.
- Rebroadcasters win auctions mostly by submitting on behalf of the DSPs without the DSP bidding directly in any way - this suggests that Rebroadcasters add value by identifying money ball auctions that DSPs miss out on.
- There are certain auction characteristics that draw Rebroadcasters in to win - perhaps auctions that are nominally uninteresting may be where Rebroadcasters can use their extra information to bid higher and win.
- Auctions with around 25% Rebroadcaster presence are both the most common types of auctions, and the auctions with the highest winning bids.

References

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[2] Patrick Bajari and Lixin Ye, *Deciding Between Competition and Collusion*, The Review of Economics and Statistics, Volume 85.

[3] Gaurab Aryal, Maria F. Gabrielli, *Testing for Collusion in Asymettric First-Price Auction*, The Review of Economics and Statistics, Volume 85.

[4] Jonathan Levin, Paul Milgrom,*Online Advertising: Heterogeneity and Conflation in Market Design*, American Economic Review, Volume 100, No. 2.

[5] Avi Goldfarb,*What is Different About Online Advertising?* Review of Industrial Organization, Volume 44, pgs 115-129.