

What is different about online advertising?

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August 2012

Forthcoming
Review of Industrial Organization

ABSTRACT

Drawing on the literature on online advertising, I argue that the fundamental economic difference between online and offline advertising is a substantial reduction in the cost of targeting. This cost reduction informs what I view as the main themes in the online advertising literature: understanding advertising effectiveness, auctions, privacy, and antitrust.

1. Introduction

Bagwell (2007, p. 1705) noted that advertising is of interest to economists because it is a “prominent feature of economic life”. As people spend more time consuming media through the internet, online advertising is becoming an increasing large fraction of the total advertising market. Some of the most prominent technology companies, including Google and Facebook, rely primarily on advertising through the internet to generate revenue. Thus online advertising is also a “prominent feature of economic life”. This article discusses how the growing literature on online advertising differs from the broader literature on advertising that preceded it.

While the rapid growth of online advertising initially led to calls for understanding a new paradigm (Hoffman and Novak 1997, Pavlou and Stewart 2000), companies use online advertising for the same reasons they deploy other kinds of advertising. Specifically, as Bagwell (2007) notes, advertising can be persuasive, altering consumer tastes. It can be informative, reducing the cost of information acquisition by consumers. Or it can be complementary to the advertised product, increasing the consumption value of a product without altering underlying preferences. To my knowledge, nothing in the literature on online advertising alters this view to suggest a new purpose for advertising.

What has changed is that the technology behind online advertising reduces the cost of targeting. Internet communication is an easily recorded direct two way communication between identifiable computers. Specifically, an end user’s computer sends a request for information (and an address) to a specific “server” computer that hosts content. The server then sends the information back to the end computer. Each such request is easily recorded in a digital “log”.

Drawing on the literature on online advertising, I argue that the fundamental economic difference between online and offline advertising is a substantial reduction in the cost of targeting. While targeting has been mentioned in the prior advertising literature, it has not been focal to understanding the economics of advertising. For example, in Bagwell's 144 page *Handbook of Industrial Organization* chapter, the word targeting appears just fifteen times. Of these, five are in the references and five in the section titled "New directions and other topics". In contrast, targeting is a recurring theme in the literature on online advertising. Just as reduced search and transportation costs have dominated the economic literature on electronic commerce (e.g. Bakos 1997, Balasubramanian 1998, Brynjolfsson and Smith 2000, Ellison and Ellison 2009, Forman, Ghose, and Goldfarb 2009), reduced costs of targeting have dominated the literature on online advertising.

In particular, a reduction in the cost of targeting informs many of the recurring themes in the online advertising literature, including understanding advertising effectiveness, auctions, privacy, and antitrust. Therefore, in this article, I review the economics literature on online advertising through the lens of targeting. I argue that much of the literature on online advertising, even research that does not explicitly emphasize targeting, is driven by models in which the cost of targeting plays a key role.

This review proceeds as follows. In the next section, I give a brief primer on the online advertising industry. Next, I review the literature on online advertising that explicitly emphasizes targeting. Then I discuss how reduced costs of targeting inform the discussions in the literature on understanding advertising effectiveness, on auctions, on privacy, and on

antitrust. I conclude with a general discussion and some caveats to the general theme discussed.

2. A Brief Primer on Online Advertising

In this section, I review the types of online advertising and the different types of targeting. The discussion draws heavily on earlier reviews, particularly Evans (2009) and Goldfarb and Tucker (2011f).¹

Online advertising can be divided into three broad categories: search advertising, classified advertising, and display advertising. *Search advertising* is the advertising that appears along with the algorithmic (or “organic”) results on search engines such as Google or Bing. Because each search is a statement of intent, advertisers can get their ads in front of people at the exact moment they are looking for something. On both Google and Bing, search advertising is priced using a specialized auction (discussed below) and each search term is priced using a different auction. Typically, advertisers pay whenever someone clicks on their advertisement (called “cost per click” or CPC). Thus, even in its simplest form, search advertising enables advertisers to target customers based on specific keyword strings. A growing marketing literature examines the returns to different targeting strategies in search advertising (e.g. Ghose and Yang 2009; Yang and Ghose 2010; Yao and Mela 2011).

Classified advertising is advertising that appears on websites that do not provide other media content or algorithmic search. Craigslist is the largest of these websites, and has been

¹ I do not emphasize the two-sided nature of advertising markets in this review. For more details on that topic, see Evans (2009) and Bagwell (2007).

credited with the decline of offline classifieds in local newspapers across the US (Seamans and Zhu 2012). Online jobs sites, and (to some extent) online dating sites, also fit into this category.

Display advertising is the main revenue generator for online media that are not search engines. It includes simple banner ads, plain text ads (such as Google's AdSense), media-rich ads, video ads, and the typical ads shown on social media websites such as Facebook. Display advertising is priced with a variety of mechanisms, depending on the website. Some is priced using specialized auctions similar to search advertising, some is priced based on negotiated purchases similar to network television, and some has a fixed price and can be purchased online or through a sales force. Typically, companies pay per viewer and prices are communicated as cost per thousand impressions (or CPM). Some display advertising is priced per click rather than per impression and a handful of companies have experimented with a hybrid auction that allows advertisers to choose whether to pay based on cost per impression and cost per click (Wilbur and Zhu 2011).

Display advertising offers a variety of opportunities to target advertising. In the 1990s, online display advertising was mainly targeted (and priced) based on user demographics, in a manner similar to television. Specifically, advertisers would place their ads on websites with the appropriate demographic audience: makeup ads on women.com and beer ads on espn.com. Over time, demographic targeting has become more sophisticated. Advertisers can target specific demographic groups (married women living in Iowa aged 60 to 64), based on information that users provide online. For example, if a user has provided detailed demographic information elsewhere (say to Google or Microsoft because of their email

account), then that information might be used to target (for example in ads managed by Google or Microsoft, including many non-Google and non-Microsoft websites).

Another form of targeting is called contextual targeting. In contextual targeting, ads match the context of the website. Search engine advertising is a form of contextual targeting in which advertisers match their ads to the content of the search. Contextual targeting is also common in display advertising: cars are advertised on cars.com, diapers are advertised on babycenter.com, and gadgets are advertised on techcrunch.com.

Finally, advertisers can use data based on past online behavior to target ads. This is called “behavioral targeting” in the industry. Typically, it involves the use of prior clickstream data to determine whether a particular customer is a good match for an ad. A form of behavioral targeting, called “retargeting”, involves showing an ad to a user who searched for (or saw) a particular kind of content. For example, if a user searched for the term “flower store”, then ads for flowers may appear as they browse the web. Similarly, if a user viewed a particular item of clothing at an online retailer, a similar item may appear in ads as they browse the web.

Next, I discuss the literature that has directly focused on targeting in online advertising.

3. Models of targeting

There is a growing literature that directly examines the impact of improved targeting on advertising. The potential for internet technology to increase customization of marketing messages was recognized early in discussions by Ansari and Mela (2003) and Murthi and Sarkar (2003). Around the same time, several theorists were developing models of targeting in the marketing literature that were aimed at improving understanding of the consequences of these

changes. For example, Chen, Narasimhan, and Zhang (2001) examined the ability to target loyal customers (as distinct from switchers) and showed that imperfect targeting can soften competition, in contrast to no targeting or perfect targeting. Gal-Or and Gal-Or (2005) reach a similar conclusion, demonstrating that targeted advertising by a monopoly media outlet can soften price competition and even enable monopoly pricing by competing advertisers. Iyer, Soberman, and Villas-Boas (2005) looked at how improved targeting affects profits in the presence of horizontally differentiated firms and heterogeneous customer preferences. They demonstrate that targeted advertising can be even more valuable than targeted pricing in a competitive environment. This paper is framed as an exploration of a general increase in targeted advertising rather than a specific contrast between online and offline advertising.

More recently, several theory papers in economics have highlighted targeting as the key difference between online and offline advertising. Bergemann and Bonatti (2011) model competition with many advertisers and many advertising markets and specifically define the difference between online and offline advertising as the ability to target and find that as exposure to online media rises, the price of offline advertising may rise (though revenues offline will fall).

Athey and Gans (2010) also explicitly examine the difference between online and offline advertising. They explore how targeting impacts the allocation of scarce advertising space. They allow media outlets to track consumer impressions so that within outlet matches are possible but investigate differing technologies to determine whether the right consumer is viewing the appropriate ad (e.g., that website visitors are, in fact, from the same location as local advertisers). They show that targeting has little value to media outlets when advertising space

is unconstrained; however, if advertising space is constrained, or advertisers have capacity constraints, then targeting improves the prospects of general outlets at the expense of tailored outlets.

Athey, Calvano, and Gans (2012) expand this framework to endogenize the allocation of consumer attention across outlets. They find that superior tracking technology may not increase profits if combined with reduced consumer switching costs online (as documented in Goldfarb 2006) and argue that this may provide an explanation for the decline in total media revenue as targeting technologies have expanded. Levin and Milgrom (2010) reach a similar conclusion regarding targeting and advertising revenue, arguing that too much targeting can hurt media revenues as markets become too thin and therefore there is no competition. They discuss a market design strategy of conflating markets in order to increase competition between advertisers and maximize revenues.

Motivated by internet technology, Johnson (2011) also explores the role of targeting and demonstrates that while targeting can benefit firms, it can hurt consumers in the presence of advertising avoidance tools. Specifically, in Johnson's model, consumers typically benefit from inframarginal ads while targeting improvements tend to affect marginal ads. Improvements in targeting technology increase marginal advertising to specific consumers, sometimes at the expense of inframarginal advertising (if other consumers use avoidance technologies).

Acquisti's (2012) paper in this issue presents a similar theme. He emphasizes that improved targeting is a key feature of "computer mediated" transactions. He examines incentives for advertisers to invest in targeting systems and shows two types of equilibria: one

type where targeting yields little benefit and another type where targeting improves consumer welfare by better matching consumers to products.

The remainder of this review discusses papers in the online advertising literature that are not explicitly about targeting but still rely on reduced costs of targeting as a key driver of the research agenda.

4. Targeting as a driver of other themes in the online advertising literature

4.1 Online advertising effectiveness

A large and growing literature has focused on the effectiveness of online advertising in general. Importantly, this is not generally a comparative literature that examines differences between online and offline advertising. The reason is that there is little well-identified analysis on the effectiveness of advertising in general. With the notable exception of a handful of field experiments that split cable TV advertisements (Lodish et al 1995a, 1995b), studies of advertising effectiveness prior to the internet focused on either artificial laboratory environments or correlations between advertising and sales. Both methods have substantial weaknesses. The laboratory studies suffer from external validity issues and the correlational studies suffer from omitted variables bias and concerns about simultaneity. Furthermore, even correlational studies are difficult to implement at the individual level because it is difficult to observe whether the same consumers see an ad and then buy the product.

In contrast, the literature measuring online ad effectiveness is thriving. One important reason is that online advertising is relatively easy to measure. The direct two-way nature of internet communication means that households that see ads are readily identified. Some

responses, such as clickthroughs, are immediate and easily measured. In addition, by using a variety of tracking technologies, advertisers can see whether those same consumers actually buy a product. Furthermore, because each end user's computer sends a specific request to the website's server and the server responds to each with a separate data packet, experiments are relatively easy online. Most of the literature has combined experiments with some tracking technology to compare advertising views with outcomes.

The ability to show randomized ads to viewers at the individual level is a direct consequence of the reduced cost of targeting. Instead of running different ads in different cities or on different television programs, the internet enables randomization at the end user level. Furthermore, the ability to observe which users view an ad and how they respond is also a consequence of the reduced cost of targeting through direct two-way communication between media source (server) and end user.

Despite these advantages, and before proceeding to the results of papers on measuring online advertising, it is important to recognize that there remain significant challenges in measuring online advertising. First, Lewis, Rao, and Reiley (2012) demonstrate the correlational studies of user response to online advertising are likely to overstate the effectiveness of advertising because of a particular type of selection bias which they label "activity bias". Thus they emphasize that field experiments are necessary to measure online advertising. However, in a separate paper (Lewis and Rao 2012), two of these authors show that experiments typically lack sufficient power to demonstrate a link between online ads and actual sales. In particular, they demonstrate that the low probability that seeing one banner ad will generate a purchase

combined with the high volatility in individual-level sales yields a requirement of millions of observations to generate sufficiently informative confidence intervals.

Next, I highlight papers in the literature that have leveraged the ability to target in order to measure advertising effectiveness, often overcoming the challenges related to statistical power by using experiments with very large samples.

Targeting, in addition to enabling this research in the ways described above, also emerges as a key result: online advertising is most effective when targeted in particular ways. Targeting was a key theme in the earlier correlational studies linking individual views of online advertising to sales (e.g. Chatterjee et al 2002; Manchanda et al 2006) and linking online advertising to the offline supply of advertising (Goldfarb and Tucker 2011b,c). For example, Goldfarb and Tucker (2012b) examine prices for law-related keywords at Google. They show that the prices of online advertising at search engines are higher when regulations make it more difficult to target offline advertising. Specifically, comparing states that regulate direct marketing by personal injury lawyers with states that do not, and comparing the prices of personal injury law keywords with other law-related keywords, they show that online prices are 5-7% higher when regulation makes targeting difficult offline.

Much of the recent literature uses field experiments to identify the value of targeting. Lewis and Reiley (2009) use an experiment on over 1.5 million individuals to measure the effect of seeing a banner advertisement on purchases at an offline retailer. Specifically, they matched email and postal addresses in a large retailer's database with Yahoo!'s user database and randomized advertising views. In the aggregate results, they find marginally significant effects of online advertising on offline sales; however, they demonstrate that the effects are

statistically significant and economically large when the ads are seen by an appropriate target group. In this issue, Lewis and Reiley (2012) dig deeper into the results of this experiment and demonstrate that it is older users that are most affected. Those over 65 had a treatment effect of nearly seven times the average, with a 20% average increase in sales per person after seeing the ad campaign.

Goldfarb and Tucker (2011d) also examine when online display ads work. They compare three million consumer responses to thousands of online advertising campaigns over an eight year period. The effectiveness of each campaign was measured by a marketing research company that combined treatment/control allocation of ads with a survey on purchase intentions. Specifically, the research company would randomly replace ads in an ongoing campaign with a different ad (typically for a non-profit). Both treatment and control groups were then recruited via an online survey invitation that appeared in a pop-up window. While response rates to the pop-up were low, the treatment-control allocation of the initial ads means that the measured effects are valid within the sample group, and that comparing ad campaigns is reasonable because all likely suffer from similar biases. This paper contrasts contextual targeting strategies with obtrusive advertising. It finds that these advertising tactics work well separately but not together: inobtrusive automotive ads are effective on car websites and ads that interrupt the screen are effective on general interest websites, but obtrusive automotive ads on car websites are less effective. The paper then documents a role for privacy concerns in driving the results. Thus, targeting online ads is generally effective, but there are limits to this effectiveness.

Other research has explored particular types of targeting. Lambrecht and Tucker (2011) show that retargeting works, but only when the retargeting is timed properly. Thus, retargeting works best when it is appropriately targeted. Tucker (2012) examines when social media targeting is effective, and Bart, Stephen, and Sarvary (2012) document the role of targeting in advertising on mobile devices.

In summary, the methods used in research on online advertising effectiveness rely on targeting. Furthermore, the dominant theme of this research is the importance of targeting in effective advertising online.

4.2 Auctions

One of the richest areas of research in online advertising has focused on auction mechanisms. This area has received considerable attention from several well-known economists. One of the reasons economists have had such interest in auctions for online advertising is likely to well-established and substantial literature on auctions in economics. In this review, I will not discuss how the literature on auctions for online advertising contributes to the broader literature on auctions, nor will I detail the particulars of the various papers.

Instead, I wish to emphasize that the widespread use of auctions to price advertising is new. It is a result of reduced targeting costs online. It is driven by both the need to price a large number of keywords in an efficient manner (targeting consumers) and a desire to price discriminate between advertisers (essentially targeting advertisers). Both are a function of the one-to-one communication between identifiable computers facilitated by the internet.

The first company to implement auctions that price keyword-specific advertising in search engines was goto.com. Later renamed Overture, and eventually purchased by Yahoo!,

goto.com implemented a straight auction in which advertisers would bid per click, and the advertiser with the highest bid would appear first in the search results. The properties of these auctions (called generalized second price auctions) were explored by Varian (2007) and Edelman, Ostrovsky, and Schwarz (2007). This literature has been extended to incorporate reserve prices (Edelman and Schwarz 2010), click weights (Liu and Chen 2006), and the incorporation of consumer choices into the model (Athey and Ellison 2009, Chen and He 2011). Agarwal, Athey, and Yang (2009) explore differences between auctions in which bidders pay per click or pay per action. Katona and Sarvary (2010) explore interaction between paid search results (the advertisements) and the algorithmic (organic) search results. Implicit in many of these models are heterogeneous bidders and the desire on the part of the search engines to price discriminate between advertisers, in other words to target the prices of advertising.

A handful of empirical papers have explored these models, again often demonstrating the roles of heterogeneous consumers, heterogeneous advertisers, and the targeting of advertising prices. Specifically, Yao and Mela (2011) show that improving the ability of advertisers to target searchers would improve search engine revenue. Athey and Nekipelov (2011) estimate a structural model of search engine advertising based on heterogeneous advertiser quality and allowing advertisers to dynamically change their bids. In an empirical study of display advertising prices across websites, Wu (2012) compares the generalized second price auction mechanism used by Google's display advertising network to the list price mechanism used by China's Taobao. He shows that the choice of mechanism is driven by the need for, and benefits of, price discrimination.

In this section, I have argued that the rise of auctions as a pricing mechanism for advertising is a consequence of the ability to target through internet technology. Instead of providing a comprehensive assessment of this large literature, I emphasize a small number of key papers that, in my view, demonstrate the link between the auction mechanism and targeting.

4.3 Privacy

One feature of internet technology that facilitates targeting is the easy collection and storage of data about customers. As discussed above, this data makes it easier to target ads, to measure the effectiveness of ads, and to sell ads to the advertiser that values them the most. The collection and use of this data has also given rise to concerns about consumer privacy. In particular, privacy concerns appear to have increased since the widespread diffusion of the internet. Goldfarb and Tucker (2012a) document this increase in underlying preferences for privacy and demonstrate that this is partly driven by an increase in the number of contexts in which consumers perceive privacy concerns to be relevant. Specifically, using millions of responses to an online survey from 2001 to 2008, we demonstrate that people provide less information about themselves toward the end of the sample than at the beginning. Importantly, this trend was strongest when the survey topic was relatively innocuous. There is no trend toward increased privacy for surveys on personal topics such as health and financial information. Instead the trend is driven by surveys about movies and consumer package goods.

Likely motivated by this trend toward increasing concern for privacy, a growing literature has examined the meaning of privacy, the role of privacy in advertising effectiveness, and tradeoffs between privacy and innovation.

The new literature on privacy builds on a small earlier wave of work on the law and economics of privacy that culminated in a 1980 special issue of the *Journal of Legal Studies* with papers by Richard Posner, Gary Becker, George Stigler, and a number of other prominent economics and legal scholars. That stream of work emphasized the challenges in understanding reasons to regulate privacy when information flows should create efficiencies. More recently, a number of theory papers (e.g. Hermalin and Katz 2006; Taylor 2004) have demonstrated in a variety of ways that price discrimination can lead to something like Akerlof's (1970) lemons problem when firms can readily share information. Hui and Png (2006) review and summarize this literature. More recently, Daughety and Reinganum (2010) demonstrate another possible source of privacy concerns: social preferences. If people care how they are perceived by others, then, under certain conditions, people may act in a way that reduces total surplus because it increases how others perceive them.

A handful of papers have documented the role of privacy concerns in influencing the effectiveness of advertising. As mentioned above, Goldfarb and Tucker (2011d) showed that privacy-focused consumers react negatively to advertisements that are both targeted and obtrusive. Laboratory studies and surveys, such Malheiros et al (2012), Tsai et al (2010), and Turow et al (2009), have documented consumer discomfort with targeted advertising. Tucker (2011) demonstrated a related result for advertising on social networks.

Despite these results, in her review of the literature, Tucker (2012) argues that although privacy concerns can reduce the effectiveness of certain ads, on balance the use of data substantially increases the effectiveness of online advertising. This argument is based on two papers we wrote together. First, Goldfarb and Tucker (2011a) demonstrated that European

privacy regulations (implemented in 2004) substantially reduced the effectiveness of online advertising. Second, Goldfarb and Tucker (2012b) combine the results of this paper with other papers in the literature to argue the privacy regulation hurts innovation in industries that use information technology heavily.

More broadly, Privacy regulation reduces innovation in general and the productivity of online advertising in particular because it inhibits the ability of firms to target the right information to the right customer. Data enables targeting. Privacy concerns are concerns about the use of data. Therefore, regulatory action on privacy is likely to reduce the effectiveness of online advertising given its reliance on targeting.

4.4. Antitrust

The online advertising industry has also received regulatory attention due to antitrust concerns. While the advertising supported internet markets were relatively unstructured in the first ten years after the internet privatized (Goldfarb 2004), more recently antitrust authorities have paid close attention to this industry. Google in particular has been the subject of antitrust investigations in both the United States and Europe. In 2008, Google's merger with DoubleClick received considerable scrutiny by both the European Commission (2008) and the Federal Trade Commission (2008). Heyer, Shapiro, and Wilder (2009) discuss some of the economics behind the Federal Trade Commission's deliberations.

Broadly, Google has received antitrust scrutiny because it has a large share of the important market for consumer searches. Whether it violates antitrust law, however, is tricky. Perhaps most importantly, in the market that it most dominates (consumer search), it gives

away its product for free. Therefore, it is hard to generate a legal argument for consumer harm through monopoly pricing of search. Therefore, regulators have focused on the source of Google's revenue: advertising. However, Google is not dominant in the overall advertising market.

Thus, an antitrust case against Google based on advertising must rely on a narrower definition of Google's competition (Ratliff and Rubinfeld 2010). So far, there has been little published empirical work on defining relevant advertising markets, though, as a legal matter, the European Commission did declare that online and offline advertising are different markets (European Commission 2010 paragraph 61). In contrast, based on our empirical work (Goldfarb and Tucker 2011b, 2011c), Goldfarb and Tucker (2011e) argue that there is clear evidence that online and offline advertising markets are substitutes, though the precise degree of cross-elasticity is unclear.

This emphasis on market definition can be seen as an acknowledgment of differences between online and offline advertising. As discussed above, the key difference is that the cost of targeting online is different than the cost of targeting offline. This means that online advertisements in general, and search advertisements in particular, are especially valuable to smaller advertisers looking for niche customers. Thus, one argument for antitrust scrutiny in online advertising (that contradicts with the somewhat limited evidence in Goldfarb and Tucker 2011b) is that these smaller advertisers do not have choices outside of the online advertising market and they therefore may face anticompetitive prices.

Research on antitrust in the online advertising industry has appeared much more in the law literature than in the economics literature.² For example, Manne and Wright (2011) present “The case against the case against Google” in the *Harvard Journal of Law and Public Policy*, emphasizing the challenges of antitrust policy in innovation-intensive industries. Goldman (2005) notes that biases in search results away from competitors could also lead to antitrust concerns for Google, even in the presence of substantial competition in the advertising market. The law literature has also discussed the possibility that Facebook might soon be subject to antitrust scrutiny (Waller 2012).

The scale of data collected by the large online advertising companies such as Google, Microsoft, and Facebook suggests a potential link between privacy, targeting, and antitrust. Edwards (2008) argued that privacy considerations, independent of direct antitrust concerns, should have been part of the deliberations on the Google-DoubleClick merger. Heyer, Shapiro, and Wilder (2009) note that large data bases can lead to natural economies of scale and network effects, potentially generating market power. In particular, if quality relies on the ability to effectively target content to users and advertisers, then quality improves with the amount of data collected. This means that companies with larger customer bases will increase their advantage over time without any new innovations beyond effective use of a larger and larger database. In contrast, Campbell, Goldfarb, and Tucker (2012) note that the regulation of data can create a barrier to entry because opt-in approvals at the company level generate economies of scope.

² Even those economists who have published on this topic, have published their work in law journals, especially the *Journal of Competition Law and Economics*.

Overall, advertising-supported websites are becoming subject to more antitrust scrutiny. The arguments for this regulatory attention depend on the use of data and the nature of targeting on the advertising-supported internet.

5. Conclusion

In this review, I have emphasized a reduction in the cost of targeting as the dominant theme in the online advertising literature, just as reduced search and travel costs are the dominant themes in the more mature literature on ecommerce (e.g. Bakos 1997, Balasubramanian 1998, Brynjolfsson and Smith 2000, Ellison and Ellison 2009, Forman, Ghose, and Goldfarb 2009). Of course, there are some parts of the literature on online advertising that do not readily fit into the lens of targeting, such as research on standards (Goldfarb and Tucker 2012c) and advertising avoidance (Anderson and Gans 2011). Nevertheless, this review as demonstrated that understanding how changes in the cost of targeting affect consumer and firm behavior is key to understanding the online advertising market.

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