

# Online Advertising

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## Abstract

This chapter explores what makes online advertising different from traditional advertising channels. We argue that online advertising differs from traditional advertising channels in two important ways: Measurability and Targetability. Measurability is higher because the digital nature of online advertising means that responses to ads can be tracked relatively easily. Targetability is higher because data can be automatically tracked at an individual level, and it is relatively easy to show different people different ads. We discuss recent advances in search advertising, display advertising, and social media advertising and explore the key issues that arise for firms and consumers from measurability and targetability. We then explore possible public policy consequences, with an in-depth discussion of the implications for consumer privacy.

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# 1 Introduction

Since the first banner ad was shown in October 1994, online advertising has grown at a furious rate. By 2009, online ads accounted for \$22 billion in spending. Online advertising is also important for what it enables. In the United States alone, websites supported by advertising represent 2.1% of the total U.S. gross domestic product (GDP) and directly employ more than 1.2 million people (Deighton and Quelch, 2009).

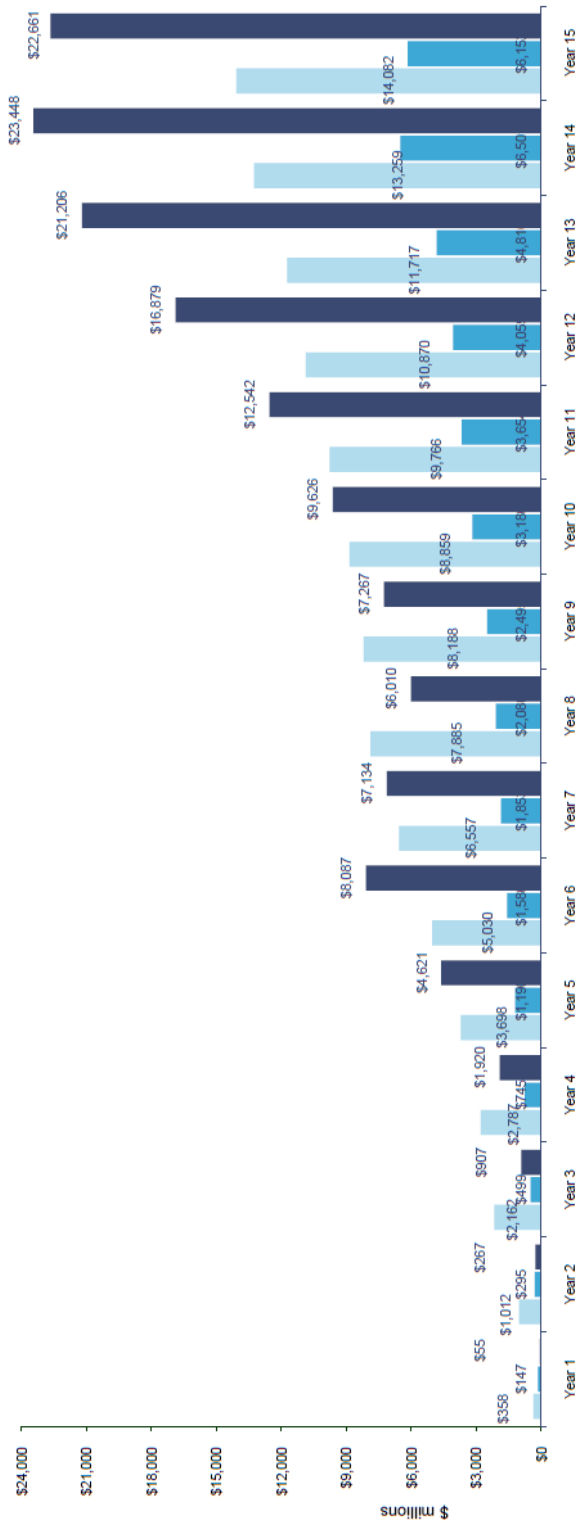
Figure 1 from IAB (2010) compares the growth of internet advertising for its first fifteen years (1995-2009) relative to cable television (1980-94) and broadcast television (1949-1963), in current inflation-adjusted dollars. It is clear that online advertising has grown much faster, especially in the last 5 years, than traditional advertising channels did in their first fifteen years. However, it is less clear whether and how online advertising differs substantively from other, more established advertising channels. It is this question we explore in this chapter.

Specifically, we draw on a wide literature to argue that online advertising differs from traditional advertising channels in two important ways: Measurability and Targetability. Measurability is higher because the digital nature of online advertising means that responses to ads can be tracked relatively easily. Targetability is higher because data can be automatically tracked at an individual level, and it is relatively easy to show different people different ads. Measurability and Targetability are key features of all kinds of online ads, including display ads, search ads, and social media ads. These features have important implications for the nature of the online ad market. For example, Measurability means that advertising agencies and platforms are more accountable. More generally, we will argue that the combination of Measurability and Targetability has implications for how companies behave in online advertising markets and gives rise to several policy issues.

We discuss these two features of online advertising in more depth in Section 2. Section 3 discusses the different kinds of online advertising and documents how Measurability and

Targetability are essential attributes of each type of online advertising. Section 4 explains the consequences of Measurability and Targetability on advertisers, advertising agencies, consumers, and ad platforms. Section 5 discusses several policy issues related to online advertising that arise from Measurability and Targetability, including privacy concerns. Section 6 concludes with some areas that seem ripe for further research.

Figure 1: Ad Revenue for the first 15 years of online media, cable TV, and broadcast TV



Source: IAB (2010)

## 2 What is different about online advertising?

We discuss in turn the two dimensions along which online advertising differs from traditional advertising: Measurability and Targetability.

### 2.1 Measurability

‘I know half my advertising is wasted, I just don’t know which half’ - John Wanamaker, department store innovator, 1838-1922.

Measuring the effectiveness of traditional advertising is hard, for two reasons.

First, it is hard to observe the link between a consumer seeing an ad and the same consumer subsequently buying the product. It appears to work (i.e., people who see the ads might be more likely to buy than people who do not), but the firm can’t see how. The firm does not know whether a consumer was motivated to buy because of a particular newspaper ad, or because of a TV ad, a specific billboard, or their new radio jingle. For long-term advertising campaigns that try to build affection over time for a particular brand, this problem is especially acute. Macy’s can observe who uses their 20% off coupon in the Sunday paper, but Budweiser cannot observe whether their Bud Light ad shown during the Superbowl is linked to higher sales in the long run.

Second, even if firms can observe a clear link between someone seeing an ad and then buying the product, it is not clear that there is a causal link between the two. This is the classic endogeneity problem of advertising. It could be merely that the kind of person who was chosen to be exposed to that kind of advertising is also more likely to purchase the product. For example, even with the coupon, Macy’s cannot observe whether the people who used the coupon would have bought anyway. Both these problems are well recognized as limitations of empirical studies in offline advertising (Assmus et al., 1984).

By contrast, online advertising is inherently measurable. The digital nature of online advertising means that individual responses to ads can be easily recorded. For example,

the effectiveness of many forms of online advertising can be measured by whether or not someone clicks on an ad. Often, through the use of cookies, IP addresses, and other tracking technologies, advertisers can go beyond this simple click metric and observe directly whether users engage in a certain online action (such as an online purchase, or subscribing to receive more information) after being exposed to an ad.

In addition to the digital nature of online advertising, another important feature of internet advertising which facilitates measurability is the way it permits randomized field tests. These are known in the industry as ‘a/b tests’. These tests randomly expose one group of consumers to a particular online ad while another group of consumers is not exposed to the ad, and compare their subsequent responses. This randomization allows precise estimates of the effect of advertising without the usual endogeneity concerns that have bedeviled previous work, because the consumers in the test are in expectation identical. Measuring effectiveness is straightforward for ads whose call to action involves clicking through on the ad. However, combined with surveys, such tests also allow for examination of brand-focused advertising. For example, Goldfarb and Tucker (2010b) use detailed survey data from online randomized field tests to examine how well online ads work at different points in the economic cycle. These online surveys (which appeared in pop-up windows) asked questions about brand favorability and purchase intent *immediately* upon a person having been exposed (or not) to a particular piece of display advertising.

While these surveys have the advantage of experimental design, the response rates are low. Only a small fraction of website visitors are willing to click on the survey pop-up, and these are likely to be the website visitors that are more susceptible to online advertising (because they responded to the ad for the survey). This means that overall advertising effectiveness measures may be biased upward. Fortunately, this bias is broadly consistent across campaigns and therefore these field studies do a good job of measuring the relative performance of advertising campaigns. Such tests therefore are a substantial improvement

over the offline state-of-the-art in benchmarking advertising campaign effectiveness.

One interesting side note is that for the first time, firms can also measure directly the extent to which online advertising is *ineffective* and the extent to which consumers try to avoid it. As discussed by Dreze and Hussherr (2003), many consumers purposely avoid directly looking at digital ads when confronted with them. This lack of attention is not unique to online advertising. Ritson (2003) documents ethnographic research that explores the extent to which people ignore television advertising. What is unique to online advertising is that researchers can cheaply and easily access quantitative measures of how ineffective advertising is. One of the challenges of any measurement of online advertising is that positive actions and effects are reasonably sparse. Few people, on seeing a pop-up ad, click through. Even fewer click through and buy. Trying to measure what ad features affect click-through rates that are less than one-tenth of one percent presents unique challenges for researchers (Lambrecht and Tucker, 2009) because current discrete choice models generally do not handle data sparsity well. This challenge is particularly acute when measuring the effects of brand advertising. Researchers like Reiley and Lewis (2009) have had to collect millions of incidents of ad exposure to be able to measure any effects precisely.

## **2.2 Targetability**

Ad targeting occurs when an advertiser selects a particular subset of potential viewers of the ad to show the ad to, and displays the ad to that subset rather than to everyone using the media platform. An example would be choosing to advertise, not to the hundreds of millions of Facebook users in general, but only to those Facebook users who are female *and* aged between 26 and 54 *and* list on their profile that they like the poet Maya Angelou. No newspaper can offer this level of targeting. The targetability of online advertising can be thought of as reducing the search costs for advertisers of identifying consumers. Targeting ads has always been known to be desirable, but internet advertising has two primary



advantages over offline advertising. First, the internet has made it virtually costless for advertisers to collect huge amounts of customer data. In contrast, the costs of collecting detailed enough individual-level data to target offline, for example through ‘direct response mail’, has generally been prohibitive except in a very few circumstances. Second, internet technology makes it relatively easy to serve different customers different ads because packets are sent to individual computers. In contrast, with current technology, splitting cable TV ads across consumer types or sending hundreds of different newspaper ads to different households is prohibitively costly.

Between the data collection and the serving of ads, targeting requires sophisticated algorithms and data processing capabilities to serve the right ads to the right people. There is nothing inherent in internet technology that makes online advertising better at this computational step, but the data collection and individual-level sending of ads make this computational step particularly fruitful.

### **2.3 Pre-Internet Targeting**

The focus on targeting of online advertising revives a theoretical literature on the potential benefits of targeted advertising. In their classic model of informative advertising, Grossman and Shapiro (1984) model both the need for and the ease of targeting. In their model, the potential customers for a product can be interpreted as the degree of differentiation ( $t$ ) in the market and the ability to target can be interpreted as the fraction of messages sent to consumers interested in the product group ( $1 - \alpha$ ). Perhaps owing to the limitations of targeting technology when the paper was written, they interpreted this parameter as the cost of advertising. However, the increasing sophistication of advertising technologies has led marketing researchers to revisit the importance of targeting. For example, Iyer et al. (2005) describe how targeting can improve equilibrium profits in the industry.

Chandra (2008), in a study of pricing of newspapers, shows that in old media the ability to price ads was a function of the similarity of user characteristics. By contrast, in online media platforms, users do not have to be similar to take advantage of targeting. Instead, the electronic automation of the serving of online ads means that users for a media platform can be very different and be shown very different ads.

Though, as described by Gal-Or et al. (2006), there have been a few attempts in older media models to target advertising based on demographics, we argue in the next section that what makes internet advertising unique is the ability to target based on *actions* or *intent*.

## **2.4 How Firms Target Online**

Many different types of online targeting are used today. Table 1 summarizes the broad categories of targeting used by advertisers in 2010. There are of course many hybrids of these techniques. The targeting techniques used vary across different advertising formats. Generally, search engines can rely on context-based advertising where ads are displayed based on the search term typed into the search engine. This means that if someone searches for information on Aviation Accident Attorneys, they see only ads that were bid on by advertisers who are advertising some form of aviation accident legal service. Search engine ads are therefore placed in the context of the stated intent of the user. Other websites, for example theknot.com, whose services are focused on a very specific topic (in this case weddings) attract advertisers who rely primarily on the fact that the user base of theknot.com will be interested in buying wedding-related products and services. By contrast, display advertising on websites where the content is not easily monetizable or matched to consumers (such as news, web services and entertainment) generally use various forms of targeting based on user behavior rather than content to try to match ads with consumers.

Behavioral targeting in its most basic form uses data from a user's clickstream to try to work out whether the user is interested in a particular service. For example, if Yahoo!

observes a person looking at Infiniti cars on Yahoo! Autos, they can use this information to then serve them ads for Infiniti cars when they look at news stories on Yahoo! News. This kind of targeting can either be conducted by a single content provider, or by an ad network that provides ads to many different websites. An ad network can use the information that someone is researching a certain Caribbean vacation destination on one website, to serve ads for resorts in that destination when a user starts reading celebrity gossip on a separate website. Murthi and Sarkar (2003) were among the first to highlight research questions related to how internet technology would enable more personalization of the ads we see.

Another increasingly important form of targeting is ‘retargeting’. This means that a website tracks whether or not a customer has expressed in interest in a particular product or service. If the customer fails to purchase the product, then the advertiser shows new ads to those specific customers in an effort to get them to return to the website. This kind of targeting is also possible in search advertising, where search ads can be replayed after the initial search and the user is searching using different search terms.

The theoretical and empirical literature has in general not distinguished between these different forms of targeting. One exception is Goldfarb and Tucker (2009), that explicitly looks at the benefits of contextual targeting in search engine advertising when offline targeting alternatives are not available. Another exception is Lambrecht and Tucker (2010), which looks at the benefits of ad retargeting at different points in the customers’ purchase decision process. However, other categories of online ad targeting such as ‘behavioral targeting’, ‘look-alike’, ‘act-alike’ and demographic targeting have not been studied explicitly in the academic literature, to the authors’ knowledge, perhaps because of their novelty.

An important development in ad targeting has been the advent of ‘real-time targeting’. The distinction between this and the two methods discussed above is that real-time targeting puts the anonymous data about users into advertisers’ hands directly rather than the media platform deciding who to serve an ad to at any one time. The label ‘real-time’ emphasizes

Table 1: Different types of Online Targeting

Name	Description
Contextual Targeting	Ad is matched to content it is displayed alongside.
Behavioral Targeting	Use prior click-stream data of customer to determine whether they are a good match for the ad. Scope generally depends on whether ad network or website publisher controls which ads get displayed.
Retargeting (Search)	Online ad is shown to user who previously searched using a particular search term
Retargeting (Website)	Online ad is shown to user who previously visited a website but did not ‘convert’
Real-Time Targeting	Advertiser has power to decide in ‘real-time’ whether to serve an ad to a customer based on data the website shares with them about that user.
‘Look-alike’ Targeting	Targeting based on users having similar characteristics to current customers
‘Act-alike’ Targeting	Targeting based on users having click-through paths which resemble successful conversions
Demographic Targeting	Publisher uses data that customer has volunteered such as age, gender, location and interests to choose whom to display ads to

the fact that this type of targeting is implemented by real-time auctions based on recent movements by a certain user.

These different targeting methods, generally of course, require media platforms to collect comprehensive data on the webpages that customers have previously browsed. This data is commonly called click-stream data. Typically advertisers and website owners track and identify users in this click-stream data using a combination of cookies, flash cookies and web-bugs.

Web-bugs are 1x1-pixel pieces of code that allow advertisers to track customers remotely.<sup>1</sup>

<sup>1</sup>These are also sometimes referred to as ‘beacons’, ‘action tags’, ‘clear GIFs’, ‘Web tags’, or ‘pixel tags’

Web bugs are different from cookies, because they are designed to be invisible to the user and also are not stored on a user's computer. This means that without inspecting a webpage's underlying html code, a customer cannot know they are being tracked. Web bugs allow advertisers to track customers as they move from one webpage to another. They also allow advertisers to document how far a website visitor scrolls down a page. Combined, this means they are very helpful in determining website visitor interests. Web bugs are very widely used on commercial websites (Martin et al., 2003). H.Murray and J.Cowart (2001) found that 96 percent of websites that mentioned a top 50 brand (as determined by the 2000 FT rankings) had a web bug.

A cookie is simply a string of text stored by a user's web browser. These allow firms to track customers' progress across browsing sessions. This can also be done using a user IP address but cookies are generally more precise, especially when IP addresses are dynamic as is the case for many residential internet services.

Advertisers tend to use cookies and web-bugs in conjunction because of the challenge of customer deletion of cookies. For example, 38.4 percent of respondents in a recent survey said they deleted cookies each month.<sup>2</sup> Therefore, web bugs (which a user cannot avoid) have been increasingly used in conjunction with, or even in place of, cookies in targeting advertising (Reiley and Lewis, 2009). Web bugs also have greater reach in terms of tracking ability than cookies, because they can be used to track consumers' scrolling within a webpage. Advertisers may also use a flash cookie as an alternative to a regular cookie. A flash cookie differs from a regular cookie in that it is saved as a 'Local Shared Object' on an individual's computer, making it harder for users to delete using regular tools on their browser.

There are also other even more comprehensive ways of obtaining user browsing behavior. For example, Phorm, an advertising agency in the UK, used deep-packet inspection to

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(Gilbert, 2008)

<sup>2</sup>Burst Cookie Survey: Consumers Don't Understand, Say Maybe Useful, But Some Delete Anyhow", Marketing Vox, June 2003

Table 2: How \$22.7 billion was distributed on Online Advertising in 2009

Type of Ad	Percentage Spent
Search	47
Display Banner Ads	22
Classifieds	10
Rich Media	7
Lead Generation	6
Digital Video	4
Sponsorship	2
E-mail	1

*Source: IAB (2010)*

evaluate the content of packets sent between the user and the ISP, at the ISP level. This is different from most behavioral targeting where users are tracked across a subset of websites only. Researchers such as Clayton (2008) argued that this is akin to ‘warrantless wiretapping’ because theoretically the firm can observe the content of private communications.

All these data types, whether cookies, clickstreams, web-bugs, etc.) are used in several ways to better target ads to customers. By examining past surfing and click behavior, firms can learn about current needs as well as general preferences. Websites and ads can even morph to fit their users’ cognitive styles (Hauser et al., 2009; MacDonald et al., 2010). For example, advertisers can use the information given by user clickstreams to assess whether users prefer visual images or text information.

### 3 Different types of online advertising

There are many different types of online advertising. Table 2 summarizes how spending was distributed across the different types in the United States in 2009.

#### 3.1 Display

“Display advertising” includes display banner ads, media-rich ads and digital video ads. Display advertising is the major mechanism by which web-pages that provide non-search content finance their websites.

In the early years of the World Wide Web, banner ads were the predominant advertising medium. Early marketing research, such as Chatterjee et al. (2003), focused on modeling ‘click-through rates’. Manchanda et al. (2006) used detailed data from a single health and beauty firm to show the effect of clicks on purchase behavior. Click-through rates were a substantial improvement over measures of offline advertising effectiveness that tried to tease out causal effects by examining time series data on advertising and sales.

However, click-through rates for banner ads have fallen sharply since the early 2000s, perhaps because they are less novel to the consumer, and because there are many more banner ads. The fall in click-through rates has led researchers to try and understand the role of banner-based brand advertising on customer behavior more generally, without relying on analysis of click-through rates. For example, Danaher and Mullarkey (2003) show that the longer a person is exposed to a web page containing a banner ad, the more likely they are to remember that banner ad. Reiley and Lewis (2009) use a large field experiment with over 1 million ad views to assess whether banner-based brand advertising where consumers are just exposed to the ad but do not click through can affect store purchases offline. They find small but positive effects, particularly for older consumers. Offline, running such field experiments, even at a much smaller scale, is extremely difficult. Internet technology meshed with an offline point of sales system facilitated the experimental design and the tracking of people after they saw the ad.

In response to falling effectiveness (as measured by, for example, click-through rates), display advertising has evolved substantially beyond the ‘electronic billboard’. Display advertising (which encompasses plain banner ads as well as new rich media and video) is now a multi-billion-dollar market where ads include many sophisticated visual and auditory features that make ads more obtrusive and harder to ignore. Another orthogonal but noteworthy development has been Google’s development of a highly profitable non-search display advertising division (called “AdSense”) that generates an estimated \$6 billion in

revenue by displaying plain content-targeted text ads. For both highly visible ads and plain content-targeted ads, advertisers carefully measure consumer response through click-throughs, through purchase intention, and through other online behavior. Goldfarb and Tucker (2010c) explore how well these divergent strategies work for online advertising, and how consumer perceptions of obtrusiveness and privacy influence their success or lack of it, both independently and in combination. They find that there is a negative relationship between targeting and the use of ‘media-rich’ features in advertising. In other words, ads that are both targeted and obtrusive are less effective at increasing purchase intent than ads that are either just targeted (like AdSense ads) or just obtrusive. That may explain why these separate advertising strategies have developed.

Overall, both measurability and targetability are important influences on the development and effectiveness of online display advertising.

### **3.2 Search Advertising**

Search engine advertising is enormously important because of the extent to which consumer search on the internet across websites is reasonably limited (Johnson et al., 2004). Search engines are a key gateway to all websites on the internet, and as such provide a crucial advertising venue. ‘Search ads’ or ‘paid search’ are the ads that appear alongside search results after a consumer types a search term or ‘keyword’ into a search engine. Typically, these ads are placed above or to the right hand side of the ‘organic’ or main search results.

In 1998, Goto.com introduced two features that set search engine advertising apart from other advertising markets:<sup>3</sup> (a) atomized pricing and display of ads based on search terms or “keywords”; and (b) automated, electronic “position auctions” to price the advertising slots for these keywords.

Because each search is a statement of intent, ads that are targeted and priced to these

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<sup>3</sup>Goto.com was renamed Overture in 2001 and purchased by Yahoo in 2003. Before 1998, search engine ads were priced by impressions and demographics.



statements of intent are highly effective. A search engine ad is a direct response to a statement of intent and therefore targets potential customers at exactly the time they are looking for something. Goldfarb and Tucker (2009) show that targeting plays an important role in generating the final prices of the auctions.

While targeting is a key aspect of search engine advertising, much of the academic literature has focused on auctions. This is likely because there was already a deep economic literature on auction pricing. There have been a variety of studies of specific features of the search advertising auction mechanism, such as the importance of position given the limited number of slots (Edelman et al., 2007; Varian, 2007); the interaction between the list of search results and the list of sponsored links on the search page (Katona and Sarvary, 2010); and whether advertisers pay for clicks or impressions (Zhu and Wilbur, 2008) or clicks or actions (Agarwal et al., 2009). Generally, auctions enable search engines to target ad prices narrowly without active involvement in setting the price for each specific keyword. The auction ensures that prices reflect the demand in the narrow advertising segment targeted by the keyword. Athey and Ellison (2009) provide a good summary of the literature.

The economic auctions literature made several early contributions to the development of search engine advertising auctions that greatly improved the efficiency of, and revenue from, these auctions. For example, Goto.com's auctions were 'first-price' auctions, where bidders paid the amount that they bid. These first-price auctions meant that advertisers would benefit by continuously updating their bids to be one penny higher than their competitors. Advertising became a time-intensive activity where advertisers would need to check the site regularly. Economic theory shows that first-price auctions lack an equilibrium, and therefore we see continuously changing prices and bids. This led to "price cycles" similar to those observed in retail gasoline markets (Zhang and Feng, 2005). Instead, a "generalized second price" auction was developed (discussed in, for example, Edelman et al. (2007); Varian (2007)) that had a stable equilibrium in which advertisers would pay the bid of the

next highest bidder. Edelman et al. (2007) and Varian (2007) also showed that ranking advertisers by the expected revenue (the price times a measure of the expected click-through rate or the "quality score") would generate higher revenues for the advertising platform (i.e. Google, Yahoo, or Bing).

There has been relatively little empirical work on search engine advertising and auctions because of the very complex nature of the position auction mechanism. One exception is Yao and Mela (2010), who make the problem tractable by looking at a hybrid auction mechanism developed for an individual website and suggest that dynamics are important in understanding firm bidding behavior. Another question addressed by academics is how the position of a search ad affects its performance. Agarwal et al. (2008) show that it is not always most profitable to be placed at the top of the position auction, but instead it is often better to be placed in the middle. This was confirmed by Ghose and Yang (2009) using a Bayesian model.

Also of interest is the relationship between organic search results (sometimes called 'algorithmic search') and search ads (or 'sponsored search'). Before the dot-com shakeout, as described by Bradlow and Schmittlein (2000), there were six search engines with different algorithms and funding strategies. A decade later there are two major search engines, Google and Bing, with Google the much larger player. For both search engines, ads appear at the same time as the organic search results that are ordered by the relevance of the results to the search. The display of both organic and sponsored listings on the same page raises the question of whether organic and paid listings are complements or substitutes. To answer this question, Yang and Ghose (2010) analyze the relationship between organic search and paid search rankings by a particular advertiser and find a positive interdependence between paid and organic search listings. Chiou and Tucker (2010a) examine this idea at a finer level and find that there is a positive relationship for search queries about generic products, but a negative relationship for searches that use brand names. Rutz and Bucklin (2008) use a

dynamic model to show that paid ads can actually have positive spillovers for later search behavior (i.e. they are complements to future search). It is important to resolve whether organic and paid search results are complements or substitutes because, as White (2009) discusses, search advertising may create incentives for search engines to reduce the quality of the organic listings if paid and organic links are substitutes. In each of the empirical studies, measuring ad effectiveness was possible due to the digitally automated nature of the advertising medium.

### **3.3 Social Media Advertising**

Marketers have always recognized that word of mouth is important. However, before online media evolved it was simply very expensive and difficult to measure it or for firms to proactively encourage it. Recent work by Trusov et al. (2009) has suggested that online word of mouth can be more effective than traditional marketing campaigns. This may be because when advertising messages are transmitted over social networks there is a potential for amplification of the message because social networks are so diffuse (Zubcsek and Sarvary, 2009; Campbell, 2010).

Online social media advertising also allows firms explicitly to direct word of mouth (Mayzlin, 2006; Godes and Mayzlin, 2009). New advertising agencies, such as Bzz Agent and Tremor, now exist to encourage positive online word of mouth. Of particular importance here are changes in regulation in October 2009 concerning Federal Trade Commission Guidelines Concerning the Use of Endorsements and Testimonials in Advertising. These were directed specifically at clarifying what constitutes an endorsement when the message is conveyed by bloggers or other ‘word-of-mouth’ marketers. Such regulatory changes may allow researchers to start to estimate the effect of authentic compared to inauthentic word-of-mouth.

A specific area of online social media marketing that is growing in importance is advertising on social networks such as Facebook. Table 3 summarizes the average time spent

Table 3: Global Reach of Social Networking Sites

Country	Unique Audience (000)	Time each Month per Person (
United States	142,052	6:09
Japan	46,558	2:50
Brazil	31,345	4:33
United Kingdom	29,129	6:07
Germany	28,057	4:11
France	26,786	4:04
Spain	19,456	5:30
Italy	18,256	6:00
Australia	9,895	6:52
Switzerland	2,451	3:54

*Source: The Nielsen Company, January 2010*

each month by users on social network websites. What is striking is just how long users are spending on these sites relative to other kinds of websites. For example, in the US people spend on average over six hours a month on these sites, which is more than double the time spent on other popular types of websites such as portals or search engines. Befitting the newness of this kind of media, empirical research is limited. Aral and Walker (2010) use data from a field experiment on Facebook concerning the distribution of a new application, and find that mandating a word of mouth response from consumers upon its adoption was more effective than making it discretionary. Tucker (2010) looks at the effect of advertising on Facebook, using a field experiment conducted by a non-profit to measure the extent to which information that users provide on social networks can be used to both target ads and personalize the content of ads.

### 3.4 Other Forms of Online Advertising

There are four other categories described in Table 2: Classifieds, Lead Generation, Sponsorship, and Email. Generally, there has been less academic research into these forms of advertising. One reason is that there is less data. For example, Craigslist.org is a powerhouse in the online classifieds world, receiving around 9 billion pageviews per month (Blodget

(2008)); however, Craigslist is notoriously protective of its users' privacy and therefore it does not share data. Two papers that do explore other types of online advertising are Tucker and Zhang (2009), who look at how websites devoted to online classifieds can grow their user base by advertising how many people are using the website, and Ansari and Mela (2003), who emphasize the role of email in facilitating customization.

## **4 Consequences of Measurability and Targetability on the Online Advertising Industry**

In this section we discuss the consequences of Measurability and Targetability on the online advertising market. First, we discuss how Measurability implies accountability and the consequences of accountability for participants in online advertising markets. Second, we discuss the role of targeting in two-sided markets such as advertising. Third, we explore substitution between online and offline advertising and document the key role that targetability plays in this substitution.

### **4.1 Accountability**

Accountability is the ability of the advertiser to now evaluate the performance of advertising media and advertising agencies on the basis of whether they have 'measured' success. This is a direct consequence of Measurability. It is a new characteristic of online advertising because for other broadcast media, measurement is so problematic that it is difficult to hold an advertising platform or an ad agency to account if an advertising campaign fails because it is not clear it has failed. Using once again the newspaper example, newspaper advertisers find it hard to reduce their ad buys in response to a lower response rate, because only a few of the responses they receive can be directly and exclusively attributed to the newspaper ad.

This change in accountability may be an important factor in the rise of disintermediation for some forms of online advertising campaigns (Arzaghi, Berndt, Davis, and Silk, Arzaghi et al.). Previously, most advertisers outsourced their media buys to a traditional advertising

agency. However, new online advertising models have led advertisers to be able to purchase advertising directly from content providers in ways that were not previously possible. Google and other search engines have faced resistance from traditional advertising agencies, who resent the fact that Google makes it easy for advertisers to buy ads for search engines directly rather than going through the advertising agency and paying a traditional commission.

Last, online advertising platforms may, in the future, be held to different standards of accountability by governments than other forms of advertising, simply because of the amount of data that is collected and the extent to which this threatens users' privacy.

There are also other key issues concerning liability that stem from this increased accountability. There is, for example, the matter of the liability of portals for materials advertised on their sites - the key litigation here is United States Court of Appeals, Ninth Circuit. - 433 F.3d 1199, Yahoo. Further, the fact that with "ad network" forms of online advertising, owners of individual websites do not necessarily know and cannot be held legally liable for the materials advertised on their website. Non-network ads provide more accountability; "ad network" ads may provide less accountability than non-network ads do, by adding back in an intermediary in the form of the organizer of the network.

## **4.2 Two-Sided Platforms and Pricing**

Online advertising markets have some of the typical features of a two-sided media platform (Evans (2008); Wilbur (2008); Anderson and Coate (2005); Baye and Morgan (2001)). Quite simply, a two-sided platform is anything that facilitates the exchange of a product, service, or information between two disparate groups of users. What makes such platforms interesting from an economics perspective is that they generate network effects because each group only wants to use the platform because of the presence of the users from the other group. For example, no advertiser would want to place a search ad on Yahoo!'s front page if there were not millions of consumers visiting it.

The two-sided structure with advertisers and viewers, combined with an ability to target to narrow audiences, means that the structure of online advertising-supported markets has some commonalities with the magazine industry (Goldfarb, 2004). However, online advertising platforms affect the relationship between advertisers and content providers in some unusual ways. Hu (2004) points out that the measurability of online advertising means that online advertising platforms can offer performance-based pricing in ways impossible with the traditional types of advertising discussed by Anderson and Coate (2005). It is not clear empirically how this has affected the advertiser-media platform relationship.

The fragmentation of the web has also destabilized traditional relationships between advertisers, advertising agencies, and media content providers. Advertising agency services have become more unbundled (Arzaghi, Berndt, Davis, and Silk, Arzaghi et al.). Television advertising buys used to be characterized by a strict set of procedures which tended to shut out individual advertisers from buying their advertising directly. Generally, it was preferable for firms to be fronted by an advertising agency, so that they could take advantage of both the bargaining power and the relationships that agency had with the television stations. However, online advertising is frequently sold remotely and through rigid pricing mechanisms such as online auctions, which are not often initially set up to reflect a media buyer's bigger marketing clout. This means that firms have less need online than offline to buy their advertising through agencies.

In addition, some research such as Wilbur and Zhu (2009) has highlighted how these new models of accountability can lead to tension when advertisers can assess the extent that they are paying for ads shown to users they did not want the ads shown to. This phenomenon is called 'click-fraud', and occurs when firms pay for clicks that are fraudulent and are either placed by the website hosting the ad or by rivals who are attempting to raise their competitors' advertising costs.

### 4.3 The effect of Online Advertising on Traditional Forms of Advertising

There is a growing literature in marketing that explores the relationship between offline and online environments for customer acquisition (Bell and Choi, 2009), brands (Danaher et al., 2003), word of mouth (Bell and Song, 2007; Forman et al., 2008), purchases (Forman et al., 2009; Brynjolfsson et al., 2009), customized promotions (Zhang and Wedel, 2009), ad pricing (Goldfarb and Tucker, 2009), search behavior (Lambert and Pregibon, 2008) and price sensitivity (Chu et al., 2008). Kempe and Wilbur (2009) discuss what television networks can learn from the best practices for the selling and pricing online advertising.

However, there has been less work that explicitly deals with the general relationship between online and offline media. Silk et al. (2001) point out that it is not clear whether internet advertising should be viewed as a threat to traditional forms of advertising. Goldfarb and Tucker (2010a) explore this in the alcohol advertising industry. They find that when states ban the advertising of alcohol on outdoor media (such as billboards and signage), the effectiveness of online advertising increases. Similarly, Goldfarb and Tucker (2009) show that search ad prices rise when offline ads are banned. These two studies suggest that online and offline advertising should be viewed as substitutes.

Two recent theory papers have emphasized how highly targeted online ads might affect the offline advertising industry. Specifically, Athey and Gans (2010); Bergemann and Bonatti (2010) investigate how the evolution of targeting technologies will affect competition in the advertising industry, and show that the effects are not necessarily negative for ‘old media firms’, as advertising becomes bifurcated between targeted and non-targeted ads. These models also suggest that targeting is most valuable in the absence of channel competition.

## 5 Regulation

It is striking how unregulated online advertising is, given its sizable economic clout and social influence. There are five major dimensions along which online advertising has been



regulated or looks likely to be regulated in the United States.

First, there have been attempts to regulate the content and placement of ads for contentious products. For example, Chiou and Tucker (2010a) study the FDA's recent attempt to limit the extent to which pharmaceutical companies can use search ads. The space constraints of the ad format mean that pharmaceutical firms cannot adequately display information about side effects. The study finds that there is a potential downside to attempts to curb pharmaceutical online advertising, as users became more likely to visit non-FDA-regulated sites, such as Canadian pharmacies and herbal alternative remedies, when pharmaceutical ads are taken down. Interestingly, there appears to have been substantial self-regulation by media platforms when it comes to other forms of contentious advertising. For example, Google does not accept hard liquor search ads, nor ads for its content networks that contain images that are not 'family safe'.

Second, online advertising can raise issues of copyright and digital rights protection. The internet has undoubtedly facilitated the re-use of media and other content, potentially without copyright holders' permission, in ways that were not possible before. Chiou and Tucker (2010b) have analyzed how regulation about use of trade-marks has affected online advertising. Generally upstream firms have resisted the use of the trade-marks and slogans by downstream resellers of their products. However, this research uses a natural experiment where Google loosened its policy regarding the use of trademarks in advertising copy, and found that firms' resistance is perhaps not warranted in all situations. They found the use of trade-marks by resellers of hotel rooms in search advertising actually increases primary demand for the hotel's own website.

Third, there is concern that the largest companies in the online advertising market are getting too big (Clemons, 2010). An important aspect of this argument is that the importance of data to targeting technology might lead to a natural monopoly. Because targeting technologies rely on data from past behavior and on experiments run on current users, the

more data a company has, the better it will be able to target its customers. This means that it might be extraordinarily difficult to overcome an initial market share lead because the initial lead means more data and therefore better targeting. Consequently, the European Union has opened an antitrust investigation into Google.

Unfortunately, there is little research to inform such an investigation. Even the market definition is not well defined. For example, while the European Union declared that online and offline advertising are separate markets in its decision on Microsoft's acquisition of Yahoo's search business, the only empirical work on the subject shows that online competes with offline (Goldfarb and Tucker, 2009, 2010a). In the theory literature, White and Jain (2010) note that it is an open question whether search and display advertising are substitutes or complements, and they show that the answer has important implications for any antitrust case. More generally, there is still little theoretical or empirical understanding of whether a dominant position in the algorithmic search market can be extended to generate a dominant position in other markets such as advertising, maps, or email.

Fourth, another area which has received some policy attention is online advertising directed at children. The Children's Online Privacy Protection Act (COPPA) was implemented in April, 2000. This rule stated that commercial websites directed to children under 13 years old or general audience sites that have actual knowledge that they are collecting information from a child must obtain parental permission before collecting such information. However, as pointed out by Montgomery and Chester (2009), given the extent to which advertisers use social media to target ads, and given the lack of clarity of current laws for these new media, it is not clear that current law is achieving this aim.

The last area, requiring a more detailed discussion, is proposed regulation concerning user privacy and the use of customer data by online advertisers.

## 5.1 Privacy

What is obvious in section 2.4 is the extent to which advertisers are able to collect detailed user-level data which they can use to optimize their advertising. Online advertising has enabled firms to track users electronically and store the data almost costlessly. The collection of such data is often argued to be harmless because it typically involves a series of actions linked by an IP address or otherwise anonymous cookie-id number. However, attempts by advertisers to use such information has met resistance from consumers due to privacy concerns. In a well-publicized survey, Turow et al. (2009) found that 66 percent of Americans do not want marketers to tailor advertisements to their interests. This customer resistance to tailored advertising is a major problem for advertisers. Theoretically, they would like to use social network data to *target* the users who see an advertisement and to *tailor* the content of advertising appeals. Fear that users may react unfavorably because of privacy concerns has led advertisers to limit their tailoring of ads. A recent survey suggested that concerns about consumer response have led advertisers to reduce the targeting of advertising based on online behavior by 75 percent (Lohr, 2010).

As discussed by Hui and Png (2006) it is not straightforward to incorporate notions of privacy into economic models. However, there are reasons to think that such collection of data may not be entirely harmless.

First, it is not clear that such data are strictly anonymous. For customers who browse using a static IP address, it is reasonably straightforward to trace back their movements to an offline identity. It is also possible to trace back user identities by various click-stream actions. For example, in Pharmatrak, Inc. Privacy Litig., 329 F.3d 9, 15 (1st Cir. 2003), the defendant was accused of having collected personal data because the plaintiffs were able to construct individually identifiable profiles for 232 users out of the 18.7 million profiles (0.001%) in the defendant's data set. In this case, the defendant (Pharmatrak) collected data

about users who browsed multiple pharmaceutical company websites, in order to compare traffic on and usage of different parts of these websites. The plaintiffs were able to construct these individual profiles largely because the web server recorded the subject, sender, and date of the web-based email message a user was reading immediately prior to visiting the website.

Second, potentially the collection of such data could lead to a form of behavioral price discrimination, that may harm consumer surplus. This has been discussed in a purely pricing context by Acquisti and Varian (2005); Fudenburg and Villas-Boas (2006) and Hui and Png (2006). Since pricing promotions are often an important feature of online advertising campaigns, consumers could be offered very different prices based on their click-stream data without their knowledge.

Third, at the moment it is not clear that property rights over such clickstream data used for targeting have been assigned in a transparent way which facilitates the post-assignment type of bargaining essential for Coasian efficiency. Instead, firms collect information on customers' clickstreams, often without informing consumers in an upfront way that they are doing so, and use that to conduct profitable advertising campaigns. Consumers are not given a chance to either profit or negotiate with advertising networks to take advantage of the profitable use that their data are being put to.

These three areas of potential negative consequences of ad-targeting and the collection of unprecedented amounts of data, have led governments to both enact and contemplate regulation to govern the collection of such data. As discussed by Baumer et al. (2004); Debussere (2005), generalized privacy regulation in Europe has curtailed to some extent to the use of web-bugs and cookies if consumers are not informed about their use. By contrast, the US has lagged behind in terms of the strictness of online privacy laws. Previously in the US, behavioral targeting was governed by self-regulation. In 2009 the Federal Communications Commission released four principles of self-governance. These are summarized in Table 4.

Table 4: FTC Principles of Self-Regulation for Behavioral Targeting

Principle	Description
Transparency and Consumer Control	Every Web site that uses behavioral targeting should clearly and concisely spell out what they are doing.
Reasonable Security, and Limited Data Retention, for Consumer Data	Firms should retain data only as long as is necessary to fulfill a legitimate business or law enforcement need.’
Affirmative Express Consent for Material Changes to Existing Privacy Promises	A firm must keep its promises to consumers regarding protecting their data. If they get bought or merged with another company, those pledges still hold, unless consumers agree to the changes. If the company revises its policies on privacy, they must receive users’ consent before implementing the new rules.
Affirmative Express Consent to (or Prohibition Against) to using Sensitive Data for Behavioral Advertising	A firm wishing to collect ‘sensitive’ personal data must get users’ permission before, not after, it starts collecting.

*FTC Staff Report: February 2009 Self-Regulatory Principles For Online Behavioral Advertising*

In the US, there have been calls from elected officials for explicit privacy regulation as opposed to relying on self-regulation. For example, Congressman Rick Boucher, chair of the subcommittee on ‘Communications, Technology and the Internet’, has proposed a draft bill to try and regulate behavioral advertising in the United States. The content of the bill has been marketed as codifying best-practices in the industry (Boucher, 2009).

However, such regulation may have costs. As set out by Evans (2009) and Lenard and Rubin (2009), there is a trade-off between the use of online customer data and the effectiveness of advertising. Goldfarb and Tucker (2010d) examined responses of 3.3 million survey-takers who had been randomly exposed to 9,596 online display (banner) advertising campaigns to explore how strong privacy regulation in the form of the 2002/58/EC Privacy Directive in the European Union has influenced advertising effectiveness. They find that display advertising became far less effective at changing stated purchase intent after the laws were enacted relative to other countries. The loss in effectiveness was more pronounced

for websites that had general content (such as news sites), where non-data-driven targeting is particularly hard to do. The loss of effectiveness was also more pronounced for ads with a smaller page presence and for ads that did not have additional interactive, video, or audio features.

An alternative approach to addressing user privacy concerns regarding advertising, rather than explicit regulation, is to empower users to control what information is used. Tucker (2010) uses field experiment data to evaluate the effect of Facebook giving users increased control over their privacy settings. She finds that after Facebook allowed users more transparent control over their privacy settings, personalized advertising, or mentioning specific details about a user in the ad-copy, became more effective. This has relatively optimistic implications for future regulation which rather than focusing on banning specific practices, could instead focus on allowing users control over their privacy settings, thereby reducing the potential to harm the online advertising industry.

## **6 Conclusions and Avenues for Future Research**

In this chapter, we have outlined the key aspects of the online advertising market. We argued that two dominant themes emerge in studying online advertising: Measurability and Targetability. These features have affected the way firms behave in these markets by increasing accountability and changing the nature of competition. The rise of online advertising has also generated a number of policy questions.

As this chapter has highlighted, there are many unexplored avenues for future academic research into online advertising. We categorize these into four major topics.

First, with respect to measurability, academic researchers have taken advantage of the evolution for the first time of reliable measures of advertising effectiveness to answer long-standing questions about advertising in general, but there has been little work that studies how ‘measurability’ has changed advertisers’ and media platforms’ relationships. There has

also been little work on what are the optimal pieces of information for internet platforms to provide to potential advertisers and whether there are ever situations where platforms benefit from not sharing information with advertisers.

Second, online advertising is unique compared to other media in terms of the ease of targeting. However, little research has been done to explore this important feature beyond simply documenting that targeting improves ad performance. However, it is important to know whether targeting is always empirically desirable or whether there are occasions when firms can miss important segments by being too targeted. Further, there has been little comparison of which methods of targeting are most effective and when they are most effective. It is also important to understand whether there are ways that online ad targeting can be conducted which simultaneously reassure users about their online privacy.

Third, the evolution of online advertising has led to a whole new eco-system of online advertising agencies and online media metrics agencies. However, we know little about how online advertising agencies operate and how they differ in their operations from traditional advertising agencies. We also know little about relative levels of control over both advertising content and placement for advertisers and media agencies have changed with the evolution of the internet. There, has also been no empirical work on how the ability of advertisers to accurately measure what part of advertising is ‘wasted’ and consequently potentially fraudulent, has changed industry structure.

Fourth, there are increasing calls for regulation in the online advertising industry; however, we know little about the potential costs and benefit of such regulations. An explicit research agenda that expands on the research cited above to examine the impact of privacy regulation, copyright law, and perhaps merger analysis would help inform policymakers.

## References

- Acquisti, A. and H. R. Varian (2005). Conditioning prices on purchase history. *Marketing Science* 24(3), 367–381.
- Agarwal, A., K. Hosanagar, and M. D. Smith (2008). Location, Location, Location: An Analysis of Profitability of Position in Online Advertising Markets. *mimeo, Wharton*.
- Agarwal, N., S. Athey, and D. Yang (2009, May). Skewed bidding in pay-per-action auctions for online advertising. *American Economic Review* 99(2), 441–47.
- Anderson, S. P. and S. Coate (2005). Market Provision of Broadcasting: A Welfare Analysis. *Review of Economic Studies* 72(4), 947–972.
- Ansari, A. and C. Mela (2003). E-customization. *Journal of Marketing Research* 40(2), 131–145.
- Aral, S. and D. Walker (2010). Creating social contagion through viral product design: Theory and evidence from a randomized field experiment. *Mimeo, NYU*.
- Arzaghi, M., E. R. Berndt, J. C. Davis, and A. J. Silk. Economic Factors Underlying the Unbundling of Advertising Agency Services. *NBER Working Paper*.
- Assmus, G., J. U. Farley, and D. R. Lehmann (1984). How advertising affects sales: Meta-analysis of econometric results. *Journal of Marketing Research* 21(1), 65–74.
- Athey, S. and G. D. Ellison (2009). Position Auctions with Consumer Search. *NBER Working Paper No. w15253*.
- Athey, S. and J. S. Gans (2010, May). The Impact of Targeting Technology on Advertising Markets and Media Competition. *AER Paper and Proceedings*.



- Baumer, D. L., J. B. Earp, and J. C. Poindexter (2004). Internet privacy law: a comparison between the United States and the European Union. *Computers & Security* 23(5), 400 – 412.
- Baye, M. R. and J. Morgan (2001). Information gatekeepers on the internet and the competitiveness of homogenous product markets. *American Economic Review* 91(3), 454–474.
- Bell, D. and J. Choi (2009). Preference minorities and the internet: Why online demand is greater in areas where target customers are in the minority. Mimeo, Wharton.
- Bell, D. and S. Song (2007, December). Neighborhood effects and trial on the internet: Evidence from online grocery retailing. *Quantitative Marketing and Economics* 5(4), 361–400.
- Bergemann, D. and A. Bonatti (2010). Targeting in Advertising Markets: Implications for Offline vs. Online Media. *Mimeo, MIT*.
- Blodget, H. (2008, April 3). Craigslist valuation: 80millionin2008revenue, worth5 billion. *Business Insider*.
- Boucher, R. R. (2009, 24 Sep). Behavioral ads: The need for privacy protection. *The Hill*.
- Bradlow, E. T. and D. C. Schmittlein (2000). The little engines that could: Modeling the performance of world wide web search engines. *Marketing Science* 19(1), 43–62.
- Brynjolfsson, E., Y. Hu, and M. Rahman (2009). Battle of the retail channels: How product selection and geography drive cross-channel competition. Mimeo, MIT.
- Campbell, J. (2010). Marketing to a network of consumers. *Mimeo, University of Toronto*.
- Chandra, A. (2008). Targeted Advertising: The Role of Subscriber Characteristics in Media Markets. *Journal of Industrial Economics, Vol. 57, No. 1, pp. 58-84, March 2009*.

- Chatterjee, P., D. L. Hoffman, and T. P. Novak (2003). Modeling the clickstream: Implications for web-based advertising efforts. *Marketing Science* 22(4), 520–541.
- Chiou, L. and C. Tucker (2010a). How Does Pharmaceutical Advertising Affect Consumer Search? *mimeo, MIT*.
- Chiou, L. and C. Tucker (2010b). How does the use of Trademarks by Intermediaries affect Online Search? *mimeo, MIT*.
- Chu, J., P. Chintagunta, and J. Cebollada (2008). Research Note—A Comparison of Within-Household Price Sensitivity Across Online and Offline Channels. *Marketing Science* 27(2), 283–299.
- Clayton, D. R. (2008, 15 April). Problems with Phorm. Technical report, University of Cambridge.
- Clemons, E. K. N. M. (2010). Regulation of digital businesses with natural monopolies or third party payment business models: Antitrust lessons from the analysis of google. *Mimeo, Wharton*.
- Danaher, P. J. and G. W. Mullarkey (2003). Factors affecting online advertising recall: A study of students. *Journal of Advertising Research* 43(03), 252–267.
- Danaher, P. J., I. W. Wilson, and R. A. Davis (2003). A Comparison of Online and Offline Consumer Brand Loyalty. *Marketing Science* 22(4), 461–476.
- Debussere, F. (2005). The EU E-Privacy Directive: A Monstrous Attempt to Starve the Cookie Monster? *International Journal of Law and Information Technology* 13(1), 70–97.
- Deighton, J. and J. Quelch (2009, June). Economic value of the advertising-supported internet ecosystem. *IAB Report*.

- Dreze, X. and F.-X. Hussherr (2003). Internet advertising: Is anybody watching? *Journal of Interactive Marketing* 17(4), 8–23.
- Edelman, B., M. Ostrovsky, and M. Schwarz (2007, March). Internet advertising and the generalized second-price auction: Selling billions of dollars worth of keywords. *American Economic Review* 97(1), 242–259.
- Evans, D. S. (2008, September). The economics of the online advertising industry. *Review of Network Economics* 7(3), 359–391.
- Evans, D. S. (2009). The online advertising industry: Economics, evolution, and privacy. *The Journal of Economic Perspectives* 23(3), 37–60.
- Forman, C., A. Ghose, and A. Goldfarb (2009). Competition between local and electronic markets: How the benefit of buying online depends on where you live. *Management Science* 55(1), 47–57.
- Forman, C., A. Ghose, and B. Wiesenfeld (2008). Examining the Relationship Between Reviews and Sales: The Role of Reviewer Identity Disclosure in Electronic Markets. *Information Systems Research* 19(3), 291–313.
- Fudenburg, D. and J. M. Villas-Boas (2006). *Volume 1: Handbooks in Information Systems*, Chapter 7: Behavior Based Price Discrimination and Customer Recognition, pp. 377–435. Emerald Group Publishing.
- Gal-Or, E., M. Gal-Or, J. H. May, and W. E. Spangler (2006). Targeted Advertising Strategies on Television. *Management Science* 52(5), 713–725.
- Ghose, A. and S. Yang (2009). An empirical analysis of search engine advertising: Sponsored search in electronic markets. *Management Science* 55(10), 1605–1622.

- Gilbert, F. (2008, May). Beacons, Bugs, and Pixel Tags: Do You Comply with the FTC Behavioral Marketing Principles and Foreign Law Requirements? *Journal of Internet Law*.
- Godes, D. and D. Mayzlin (2009). Firm-Created Word-of-Mouth Communication: Evidence from a Field Test. *Marketing Science* 28(4), 721–739.
- Goldfarb, A. (2004, September). Concentration in advertising-supported online markets: an empirical approach. *Economics of Innovation and New Technology* 13(6), 581–594.
- Goldfarb, A. and C. Tucker (2009). Search engine advertising: Pricing ads to context. Mimeo, MIT.
- Goldfarb, A. and C. Tucker (2010a). Advertising Bans and the Substitutability of Online and Offline Advertising. *Forthcoming, Journal of Marketing Research*.
- Goldfarb, A. and C. Tucker (2010b). Boom to bust advertising. *mimeo, MIT*.
- Goldfarb, A. and C. Tucker (2010c). Online display advertising: Targeting and obtrusiveness. *Forthcoming, Marketing Science*.
- Goldfarb, A. and C. Tucker (2010d). Privacy regulation and online advertising. *Forthcoming, Management Science*.
- Grossman, G. M. and C. Shapiro (1984, January). Informative advertising with differentiated products. *Review of Economic Studies* 51(1), 63–81.
- Hauser, J. R., G. L. Urban, G. Liberali, and M. Braun (2009). Website morphing. *Marketing Science* 28(2), 202–223.
- H.Murray, B. and J. J.Cowart (2001). Webbugs a study of the presence and growth rate of web bugs on the internet. Technical report, Technical Report, Cyveillance, Inc.

- Hu, Y. J. (2004). Performance-based Pricing Models in Online Advertising. *mimeo, Purdue University - Krannert School of Management*.
- Hui, K. and I. Png (2006). *Economics and Information Systems, Handbooks in Information Systems, vol. 1*, Chapter 9: The Economics of Privacy. Elsevier.
- IAB (2010, April). Iab internet advertising revenue report: 2009 full-year results. Technical report, IAB and Price waterhouse Coopers.
- Iyer, G., D. Soberman, and M. Villas-Boas (2005). The targeting of advertising. *Marketing Science* 24(3), 461.
- Johnson, E. J., W. W. Moe, P. S. Fader, S. Bellman, and G. L. Lohse (2004). On the Depth and Dynamics of Online Search Behavior. *Management Science* 50(3), 299–308.
- Katona, Z. and M. Sarvary (2010). The Race for Sponsored Links: Bidding Patterns for Search Advertising. *Marketing Science* 29(2), 199–215.
- Kempe, D. and K. C. Wilbur (2009). What can television networks learn from search engines? how to select, order, and price advertisements to maximize advertiser welfare. *Mimeo, Duke*.
- Lambert, D. and D. Pregibon (2008). Online effects of offline ads. In *ADKDD '08: Proceedings of the 2nd International Workshop on Data Mining and Audience Intelligence for Advertising*, New York, NY, USA, pp. 10–17. ACM.
- Lambrecht, A. and C. Tucker (2009). Paying with money or with effort: Pricing when customers anticipate hassle. *mimeo, LBS*.
- Lambrecht, A. and C. Tucker (2010). Behavioral targeting, retargeting and customer decision making. *mimeo, MIT*.

- Lenard, T. M. and P. H. Rubin (2009). In Defense of Data: Information and the Costs of Privacy. *Technology Policy Institute Working Paper*.
- Lohr, S. (2010, April 30). Privacy concerns limit online ads, study says. *New York Times*.
- MacDonald, E., R. Bordley, J.-M. Kim, and G. Urban (2010). Improving click-through with web advertisements designed for cognitive style. In *Marketing Science Presentation*.
- Manchanda, P., J.-P. Dube, K. Y. Goh, and P. K. Chintagunta (2006). The effect of banner advertising on internet purchasing. *Journal of Marketing Research* 43(1), 98 – 108.
- Martin, D., H. Wu, and A. Alsaïd (2003). Hidden surveillance by web sites: Web bugs in contemporary use. *Commun. ACM* 46(12), 258–264.
- Mayzlin, D. (2006). Promotional chat on the internet. *Marketing Science* 25(2), 155–163.
- Montgomery, K. and J. Chester (2009). Interactive food and beverage marketing: Targeting adolescents in the digital age. *Journal of Adolescent Health* 45, 518–529.
- Murthi, B. and S. Sarkar (2003, October). The role of the management sciences in research on personalization. *Management Science* 49(10), 1344–1352.
- Reiley, D. and R. Lewis (2009). Retail advertising works! measuring the effects of advertising on sales via a controlled experiment on yahoo!”. Working Paper, Yahoo! Research.
- Ritson, M. (2003, 04 February). Creative business: Talking, reading, tasking. *Financial Times*.
- Rutz, O. J. and R. E. Bucklin (2008). From Generic to Branded: A Model of Spillover Dynamics in Paid Search Advertising. *mimeo, UCLA*.
- Silk, A. J., L. R. Klein, and E. R. Berndt (2001). The emerging position of the internet as an advertising medium. *Netnomics* 3(2), 129–148.

- Trusov, M., R. E. Bucklin, and K. Pauwels (2009, September). Effects of word-of-mouth versus traditional marketing: Findings from an internet social networking site. *Journal of Marketing* 73, 90–102.
- Tucker, C. (2010). Social networks, personalized advertising, and privacy controls. *mimeo, MIT*.
- Tucker, C. and J. Zhang (2009). Growing two-sided networks by advertising the user-base: A field experiment. *forthcoming, Marketing Science*.
- Turow, J., J. King, C. J. Hoofnagle, A. Bleakley, and M. Hennessy (2009). Americans Reject Tailored Advertising and Three Activities that Enable It. *Mimeo, Berkeley*.
- Varian, H. (2007). Position auctions. *International Journal of Industrial Organization* 25(6), 1163–1178.
- White, A. (2009). Search engines: Left side quality versus right side profits. *Mimeo, Toulouse School of Economics*.
- White, A. and K. Jain (2010). The attention economy of search and web advertisement. *Mimeo, Toulouse School of Economics*.
- Wilbur, K. C. (2008). A two-sided, empirical model of television advertising and viewing markets. *Marketing Science* 27(3), 356–378.
- Wilbur, K. C. and Y. Zhu (2009). Click Fraud. *Marketing Science* 28(2), 293–308.
- Yang, S. and A. Ghose (2010). Analyzing the Relationship Between Organic and Sponsored Search Advertising: Positive, Negative, or Zero Interdependence? *Marketing Science*, mksc.1100.0552.

- Yao, S. and C. F. Mela (2010). A Dynamic Model of Sponsored Search Advertising. *Mimeo, Kellogg*.
- Zhang, J. and M. Wedel (2009). The effectiveness of customized promotions in online and offline stores. *Journal of Marketing Research (JMR)* 46(2), 190 – 206.
- Zhang, X. and J. Feng (2005). Price cycles in online advertising auctions. *Mimeo, MIT*.
- Zhu, Y. and K. C. Wilbur (2008, October). Strategic bidding in hybrid cpc and cpm auctions. *NET Institute Working Paper (08-25)*.
- Zubcsek, P. P. and M. Sarvary (2009). Direct marketing on a social network. *Mimeo, Insead*.

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