The Online Advertising Industry: Economics, Evolution, and Privacy

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Abstract

Online advertising accounts for almost 9 percent of all advertising in the United States. This share is expected to increase as more media is consumed over the internet and as more advertisers shift spending to online technologies. The expansion of internet-based advertising is transforming the advertising business by providing more efficient methods of matching advertisers and consumers and is transforming the media business by providing a source of revenue for online media firms that compete with traditional media firms. The precipitous decline of the newspaper industry is one manifestation of the symbiotic relationship between online content and online advertising. Online-advertising is provided by a series of interlocking multi-sided platforms (also known as two-sided markets) that facilitate the matching of advertisers and consumers. These intermediaries increasingly make use of detailed individual data, predictive methods, and matching algorithms to create more efficient matches between consumers and advertisers. Some of their methods raise public policy issues that require balancing providing consumers more valuable advertising against the possible loss of valuable privacy.

Advertising delivered over the internet—"online advertising"—has become a significant source of revenue for web-based businesses. Fifty-six of the top 100 websites based on page views in February 2008 presented advertising; these 56 accounted for 86 percent of the total page views for these 100 sites.[1] Twenty-six of these 56 sites, accounting for 77 percent of all page views for the top 100 sites, likely earn most of their revenue from selling advertising. Advertising is a significant source of revenue for many of the smaller sites including ones such as blogs that occupy the long-tail of the web. Online advertising is also central to the $34 billion e-commerce economy **(**U.S. Department of Commerce**,** 2008), which is becoming an ever larger portion of overall commerce. Web-based sellers use online advertising to drive consumers directly to their sites where they can browse for goods and services and purchase them with a few clicks. Online advertising accounted for 8.8 percent of all advertising in the United States in 2008 (Hallerman, 2008). That share is expected to grow as people spend more time with new online media such as social networking and sites that offer user-generated content; as more traditional media such as television is transmitted over the internet; and as more advertising is delivered to browser-enabled mobile phones.[2]

[1] The top websites were based on ComScore MediaMetrix rankings. A researcher reviewed each website to determine whether it presented advertising on the home page or immediate branches of the home page. They determined whether advertising was the most significant source of revenue based on considering other apparent sources of revenue and the business model followed by the site. The appendix provides the details. The top 100 websites accounted for 41 percent of all page views on the web according to ComScore.

[2] Moreover, a consortium of cable television providers are developing methods for delivering targeted advertising to cable subscribers over their networks; although the advertisements are delivered over the closed cable networks rather than over the internet the targeting methods and business models are similar to those used for online advertising. Tim Arango, Cable Firms Join Forces to Attract Focused Ads, NY Times, Mar. 10, 2008.

Internet-based advertising is the source of a "gale of creative destruction" (in the words of Schumpeter, 1942) that is sweeping across the advertising and media landscape, especially in the United States. Newspapers, particularly, are losing readers and advertisers to web media supported by online advertising. That has lead to a downward spiral as indirect network effects work in reverse. The market caps of the major publicly traded newspaper businesses in the United States declined by 42 percent between January 2004 and August 2008, compared to a 15.6 percent increase for the Dow Jones Industrial average over that same time period (Blodget, 2008). With the additional pressure of the financial crisis, newspapers in several major cities including Denver and Seattle have closed down and others including the *New York Times* are in distress. More generally, online advertising is disrupting all aspects of the global advertising industry, which had estimated revenues of $625 billion in 2007 (Minton, 2007), from how creative work is done, to how advertising campaigns are run, and to how advertising is bought and sold.

Online advertising methods are, arguably, leading to significant reductions in transactions costs between merchants and consumers. The methods enable merchants to deliver information that is targeted to those consumers who value the information the most and are most likely to act on it. An oft-quoted line in the advertising business states ruefully: "Half the money I spend on advertising is wasted. The only trouble is I don't know which half." The new techniques replace a sledgehammer with a scalpel. In doing so, they collect and analyze detailed information about how people use their computers – raising difficult issues concerning the expectation of privacy and the regulation of the online advertising industry.

No research has yet examined the value of the productivity improvements created by online advertising technology but they appear significant. Consider a business that sells

saltwater fishing rods to people who enjoy fly fishing. The traditional approach to matching this buyer and seller involved the creation of a magazine, such as *FlyFisherman*, with content that attracts the relevant people. In contrast, the online approach relies on a variety of techniques to match an advertising message to a consumer. A search engine indexes web results that are relevant to a consumer who types in the phrase "saltwater fishing rod," and with this information, the search engine can sell ads to sellers of saltwater fishing rods. Contextual advertising on web pages could do the same thing. A consumer who visits a blog for fly fishermen could be presented with an advertisement. Developing behavioral targeting techniques, discussed below, can also identify individuals who are interested in fly fishing and determine whether they are looking around the web for information that would suggest they might be in the market for a saltwater rod.

This essay presents the evolution of the online advertising business. It examines the supply of online advertising "inventory," which equals the space times the views of that space; the demand for that inventory; and intermediaries that operate between the sell and buy sides. It also explores some of the key developments such as behavioral targeting for matching advertising messages to consumers and considers some economic aspects of the privacy issues that these technologies raise. Aside from providing a survey of an important new segment of advertising this essay suggests, at various points, that many of the interesting questions, and economic puzzles, about the advertising industry—offline and online—remain to be addressed. For example, online advertising is a "two-sided market" (Rochet and Tirole, 2003; Anderson et al., 2005), as is advertising generally. Intermediaries operate platforms that facilitate advertisers and consumers connecting with each other. Innovative intermediaries operate exchanges and

face the critical liquidity issues discussed in the market microstructure literature (O'Hara, 1998; also see Evans and Schmalensee, 2009).

Evolution of online advertising

Online advertising started in 1994 when HotWired, a web magazine, sold a banner ad to AT&T and displayed it on their web page (Kaye and Medoff, 2001). The ad was sold based on the number of "impressions"— individuals who saw the ad—which was the model followed by most traditional media for this sort of brand advertising. Many web ads were subsequently sold based on "cost per mille," which is advertising terminology for cost per 1000 viewers of the advertisement and often referred to as CPM. Paying by number of viewers remained the norm until Procter & Gamble negotiated a deal with Yahoo! in 1996 which compensated the web portal for ads based on the "cost-per-click" (commonly known as CPC). Yahoo! was paid only when a user clicked on the ad; this was the web-version of the direct response method commonly used by advertisers for things such as mail and telephone solicitations. However, we will see that most "display ads" on websites—the ads that look like those in newspapers and magazines—were still sold based on thousands of views as of 2008.

The exploding supply of web pages led to the birth, in 1994, of several search engines that also sold advertising to make money. At first, they sold banner ads on a cost-per-mille basis—that is, based on how many people saw the ad. However, that approach led to a conflict for the search engine between helping people find things quickly and keeping eyeballs trained on the site to make money. The search engines later moved to the cost-per-click model. GoTo.com—which is now owned by Yahoo!—introduced many of the key technological and business model innovations in the next three years ("GoTo to Overture," 2005; "History of Pay Per Click, 2007). These included adopting the cost-per-click approach to pricing and the use of auctions to allocate the advertising spots on the page showing results of the search.

During this same period, fairly traditional methods of advertising were mimicked on the web. These included web versions of business directories similar to the yellow pages such as yellowpages.com; web versions of newspaper classified ads such as Craigslist; and web versions of direct mail and telephone marketing such as CheetahMail. These web-based vehicles were

charged for in ways that were similar to their traditional counterparts with the exception of Craigslist, which provided a significant amount of free advertising to consumers. The remainder of this essay does not discuss web-based directories or email advertising because they do not raise particularly novel issues.

Online advertising revenue has increased steadily over time in absolute terms and as a fraction of all advertising revenue. Consistent figures are available since 2000. They show that U.S. online advertising has increased from $8.1 billion in 2000 to $21.2 billion in 2007 and from 3.2 percent of all advertising to 8.8 per cent over that time period (based on Interactive Advertising Bureau Press Releases 2000-2007). The relative mix of online advertising has also changed. Table 1 shows the evolution of various online advertising formats from 2000 until the first half of 2008. In 2008, search and display-related ads were the leading advertising formats with 44 per cent and 21 per cent share of the total revenue, respectively. However, ads that are linked to the results of a keyword search have grown explosively from 1 percent of online advertising revenue in 2000 to 44 percent in 2008, while display ads dropped from 48 percent of total revenue in 2000 to 21 percent of total revenue by the first half of 2008.

Table 1. Evolution of Online Advertising Formats

Advertising Format	2000	2001	2002	2003	2004	2005	2006	2007	2008*
	share of the total revenue coming from this format								
Display Related	**78%**	**72%**	**60%**	**42%**	**39%**	**34%**	**32%**	**34%**	**33%**
- Banners	48%	36%	29%	21%	19%	20%	22%	21%	21%
- Sponsorships	28%	26%	18%	10%	8%	5%	3%	3%	2%
- Rich Media	2%	2%	5%	8%	10%	8%	7%	8%	7%
- Slotting Fees	0%	8%	8%	3%	2%	1%	0%	0%	0%
- Digital Video	0%	0%	0%	0%	0%	0%	0%	2%	3%
Search	**1%**	**4%**	**15%**	**35%**	**40%**	**41%**	**40%**	**41%**	**45%**
Classifieds	**7%**	**16%**	**15%**	**17%**	**18%**	**17%**	**18%**	**16%**	**14%**
Lead Generation	**4%**	**2%**	**1%**	**1%**	**2%**	**6%**	**8%**	**7%**	**7%**
Email	**3%**	**3%**	**4%**	**3%**	**1%**	**2%**	**2%**	**2%**	**2%**
Interstitials	**4%**	**3%**	**5%**	**2%**	**0%**	**0%**	**0%**	**0%**	**0%**
Other	**3%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**

**Figures are rounded*

Ad Formats Definitions:

Banner is a space (usually rectangular) on a Web page that shows the advertiser's message.
Sponsorships represent custom content and/or experiences created for an advertiser which may or may not include ad elements. (e.g, reskinning a section of a web site with the advertiser's branding).
Rich Media refers to advertisements that incorporate animation, sound, and/or interactivity in any format.
Slotting fees the fee charged for premium ad placement and/or exclusivity.
Digital Video format includes commercials that appear in live, archived, and downloadable streaming content.
Search refers to advertising by paying Internet companies to list and/or link their company site domain name to a specific search word or phrase. It includes paid listings (text links appear at the top or side of search results for specific keywords), contextual search (text links appear in an article based on the context of the content, instead of a user-submitted keyword), and paid inclusion (guarantees that a marketer's URL is indexed by a search engine).
Classifieds: posting a product or service in an online listing for a fee.
Lead Generation are referrals to qualified purchase inquiries.
Email ads include banner ads, links or advertiser sponsorships that appear in commercial email communication.
Interstitials are ads displayed during a transition from one Web page to the next.

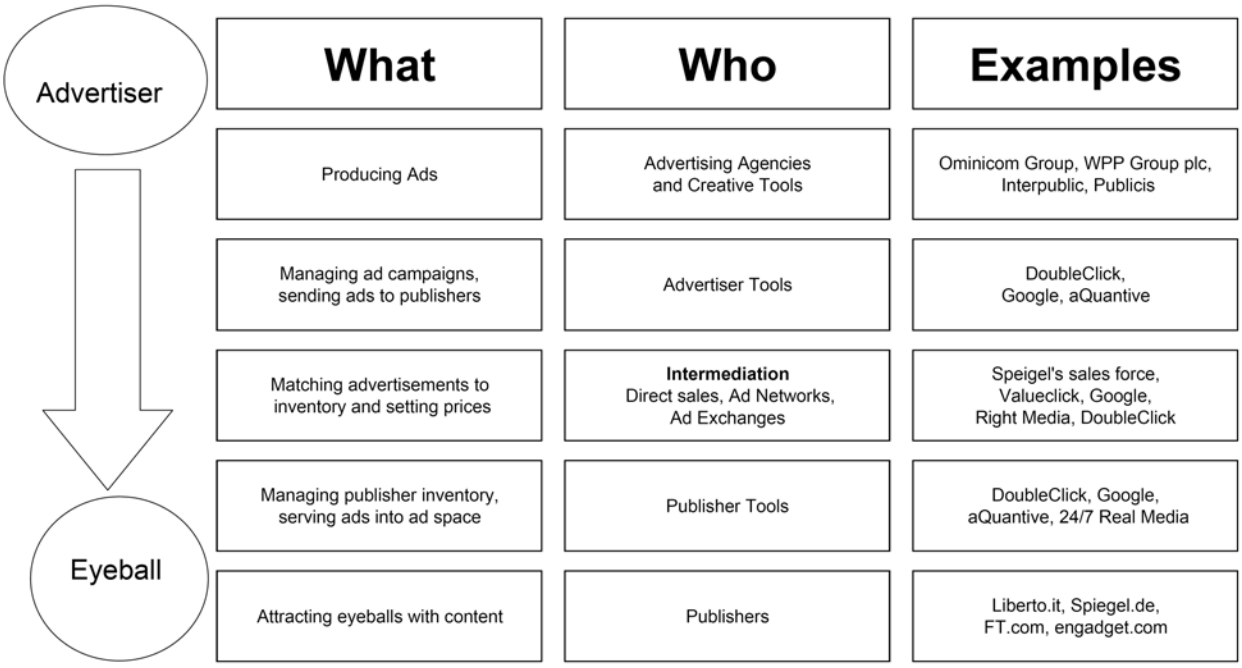
Source:Interactive Advertising Bureau Annual Reports and Press Releases, 2000-2008

In 2009, fifteen years after its birth, the online advertising industry remains in considerable flux. The delivery of online advertising exhibits rapid technological change. At the same time, new economic structures are emerging and business relationships among the key players are changing. For example, in 2008, Google completed its acquisition of DoubleClick, which was a major technology provider, and Microsoft entered into negotiations, ultimately aborted, to buy Yahoo! Nevertheless, certain features of the "online advertising ecosystem" have become clear and provide a useful framework for this discussion.

On one side of the business are advertisers that want to reach consumers and consider online advertising as a possible way to do that. On the other side are consumers who may or may not be receptive to receiving advertising messages. In between are various intermediaries.

The fully integrated intermediaries touch consumers and advertisers directly. The search-based advertising platforms (Evans, 2008) are examples: they bring consumers to their search results pages and sell access to these consumers directly to advertisers; their platforms integrate all the necessary technology for doing this. Many intermediaries are partly integrated. Publishers such as reuters.com bring consumers to their sites and have direct sales forces that sell advertising inventory directly to advertisers. But these publishers also typically rely on technology providers ("ad servers") that handle passing ads from the advertisers to the publishers' advertising spaces as well as advertising networks which aggregate online advertising inventory and sell it to advertisers. Finally, some publishers are highly specialized and contract most tasks out. That is true of blogs—even large ones—which rely on ad networks such as Google's Content Network to sell ads for them and to provide the relevant technology. Figure 1 shows the relationship between the various agents.

Figure 1. Relationship between Various Online Advertising Businesses



Almost all of the participants in intermediation between advertisers and consumers operate multi-sided platforms, sometimes working with agents for the advertiser or consumer. For example, media-buying firms work for advertisers and advertising agencies on the "buy

side" and with publishers on the "sell side." This results in an industry of interlocking multi-sided platforms. Some of these platforms have more "sides" than just buy and sell. Facebook, for example, operates a software platform (Evans, 2009) that encourages developers to write applications that also enlist advertisers and consumers.

As with advertising generally, a key feature of online advertising is that consumers are paid with content and services to receive advertising messages and advertisers pay to send these messages. A fundamental question, not addressed here, is why this particular pricing and reward structure has held over long periods of time and across many different types of advertising. Among other things, the answer would help to illuminate the extent to which advertising is a method for reducing transactions costs between buyers and sellers or a source of imperfection that distorts decision making (Bagwell, 2002).

Online versus Offline Advertising

The fundamental differences between online and traditional advertising result from a combination of internet technologies and the nature of the web. The structure of online communications makes it easy for publishers and ad networks to learn considerably more about online users than has been possible with traditional media such as print, radio, and television. Online media or their ad networks typically know for certain from the internet technologies for linking people to sites that an individual is viewing their site. That is very different from a radio station, or a newspaper, which have limited ability to determine whether a particular individual is listening or reading. Online media can often learn valuable details about the individual that has signed on to the site. Each user has an IP (Internet protocol) address which typically identifies the location of the individual down to at least the zip code level in the United States. People who browse from home and from smaller companies typically have a unique IP address that remains the same over time. Using this address it is possible for online media and advertising networks to track other sites that users with that IP address have visited and to match up other details about the individual or household. (Some large companies change the IP addresses of individual users frequently so that the address cannot identify the user uniquely nor provide a

precise geographic location. As a result online media cannot determine much about people who browse from these companies.)In addition, individual websites, such as wsj.com and myspace.com, may have detailed information on registered users which they can also use for advertising. Print, radio and television media generally do not know this level of information for individual users; cable systems with set-top boxes also have specific information on viewers (Lafayette, 2008) but do not have ready access to the browsing behavior of those individuals.

Traditional media usually have static scheduled content. Television and radio shows are broadcast at a particular time, newspapers are published daily, and magazines weekly or monthly. Advertisers and their intermediaries have no way of knowing whether an individual can hear or see their advertisements. Television viewers may leave the room and radio listeners may switch the channel when the ads come on. Readers may not necessarily look at particular newspaper and magazine pages with advertising. Consumers have much greater control over the content they view on websites. Advertisers and their intermediaries know with great confidence what content a consumer is viewing at a particular point in time. These facts have two implications. First, advertisements can be targeted to the particular view that is taking place. The platform can determine the time of day and location of the view and may also be able to determine various other characteristics of the viewer. Most on-line advertising inventory is selected in "almost" real time and customized for the particular viewer. The technology makes decisions on the ad to insert in a particular space so quickly that when you look at web page you cannot detect that it has been designed in less than the blink of an eye. Thus, advertisers have the ability to customize their advertising purchases in a way that is not cost-effective offline. Second, the advertising platform can often discern the context of why the viewer has come to the publisher's web page. For example, search engines know the keywords a user requested, and publishers know the content of the page the user is looking at. Both may know recent search or browsing behavior. Ads can be customized based on this information.

These features can make online advertising a more efficient matchmaking vehicle for advertisers and viewers than offline advertising. Advertisers can target their messages to those consumers for whom the messages are most relevant and who are most likely to buy as a result of receiving this message. Viewers are more likely to receive messages that are relevant and valuable to them. An implication of this observation is that there are economic incentives for advertising and viewing to move online.

Supply of Advertising Space and its Market Structure

Any website that attracts viewers is a potential supplier of advertising inventory. Some websites choose to make money mainly in other ways: for example, e-commerce, gaming, adult sites, and a few others are largely free of advertising. But, as noted earlier, websites that account for a preponderance of page views among the top 100 sites earn most of their revenue from advertising. Table 2 shows the 20 largest advertising-supported sites in terms of page views, as of February 2008, and describes the content they use to attract eyeballs. Notable sites include Google, which primarily uses search results as well as user-uploaded video for its YouTube site; Yahoo!, which owns properties ranging from entertainment to automotive to email on which it presents ads; and Facebook, which operates a social networking site in which users see advertising on their own pages, the pages of their friends, and on other pages specifically designed for advertisers. The Table also reports 2008 advertising revenue for sites where this is publicly available—that ranges from a low of $130 million for Facebook to a high of $7.4 billion for Google.

Table 2. The Top 20 Web Properties with Ads and the Content They Use to Attract Viewers

Rank	Property	Content	2008 Internet Advertising Revenues($M)
1	Fox Interactive Media	entertainment video, news, social networking, image hosting, games network	900
2	Yahoo! Sites	search results and various applications (news, email, weather forecast)	3430
3	Google Sites including YouTube	search results, email, maps, user-generated videos, blogs	7430
4	Microsoft Sites*	search results, email, entertainment videos, music, news	1970
5	AOL LLC	news, entertainment, email, search results, greetings	1360
6	FACEBOOK.COM	social networking site	130
7	eBay	online auction and shopping site for mostly used goods	2370
9	Comcast Corporation	TV listings, Free TV episodes, cable television services	
10	Viacom Digital	entertainment news, videos, music clips, TV listings, reviews	
11	Time Warner - (excl. AOL)	movies, TV schedule, videogames, cable television services,	
14	Amazon Sites	online shopping site, daily blog, customer reviews	
15	EA Online	strategy video games	
16	Ask Network	search results, public generated questions and answers, maps, news	480
17	Photobucket.com LLC	image and video hosting, sharing applications	
19	BEBO.COM	social media network, music, videos, applications	
21	Cox Enterprises Inc.	news, entertainment news, motor vehicles marketplace	
22	Disney Online	entertainment videos for kids, games, music library, fairy tale creating applications	270
24	United Online, Inc	floral product, internet services, social networking	
25	Glam Media	news and content on fashion, health and life style	
26	ESPN	sports news and videos, TV listings, sports results and rankings	

Notes:

1) Source: comScore Media Metrix data for February 2008.

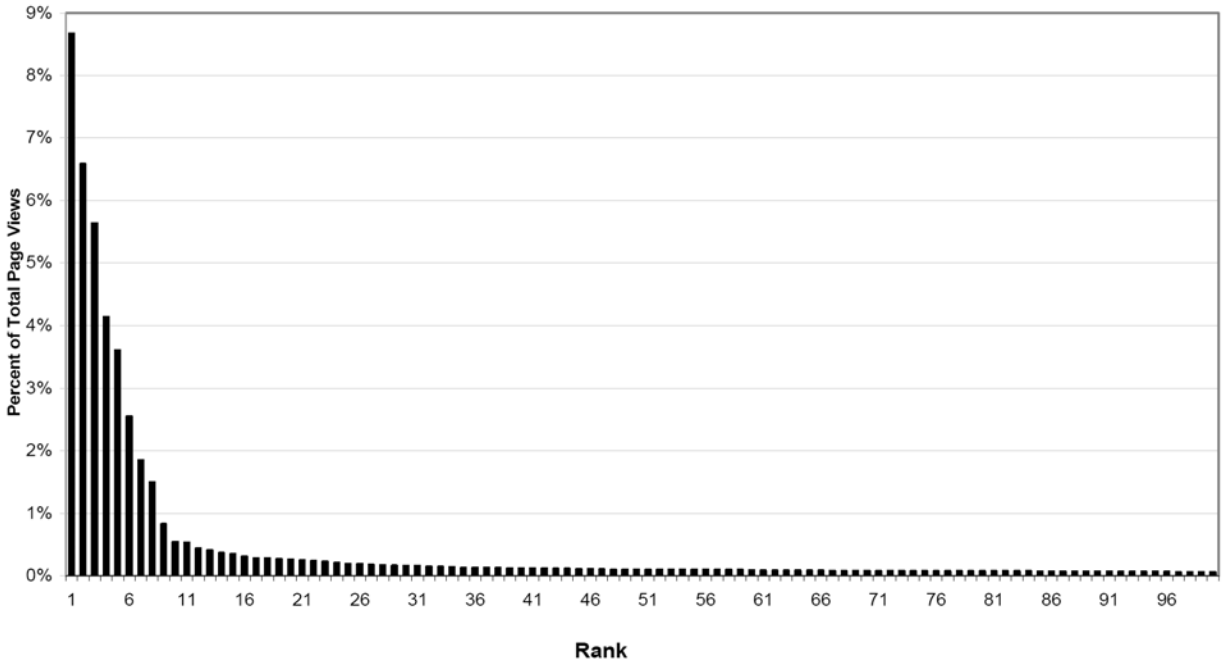
2) Rankings are based on page views. Only web properties with ads are included. Some properties included well-known sites which are therefore not broken out separately; MySpace is included in the Fox properties and accounts for 98 percent of page view

3) Content information is determined through direct website reviews.

4) Although not all of Microsoft sites supply advertisements, e.g, MICROSOFT.COM, MSN.COM gains most of its revenue from displaying ads and accounts for 95% of all page views of Microsoft sites.

The supply of advertising inventory is highly skewed. Thousands of web sites supply some advertising inventory in addition to the top one hundred. While comprehensive data on sites that supply advertising is not available, Figure 2 shows the overall distribution of page views, which is likely a good approximation of the distribution. As of February 2008, the top 10 sites accounted for 36 percent of page views, the top 300 accounted for 54 percent of page views, and top 10,000 websites attracted 67 percent of the total page views.

Figure 2. Distribution of Page Views for the Top 100 Websites



Source: comScore MediaMetrix February 2008.

There are four large fully integrated suppliers of advertising inventory in the United States: AOL, Google, MSN, and Yahoo! Each of these sites is a "publisher" in the sense that it presents content which is used to attract viewers to their pages. Each also acts as a "distributor" of ad space by directly selling inventory to either advertisers or "brokers" that act as middlemen and match publishers with advertisers. Finally, these four sites supply most of their own technology. To be more specific, they operate the software and communication technology that takes copy from an advertiser and inserts it into space at the appropriate time for a viewer. In addition, MSN and Yahoo! are horizontally integrated into search; both of these entities have their search query tool incorporated in their portals.

Most of the other large suppliers are partly integrated. They usually rely on providers of publisher-serving technology for the software and communications system that receives copy from advertisers and then make decisions on where and when to insert that copy into inventory. They typically have their own sales forces that distribute their inventory to advertisers. But they

also rely on advertising networks to sell space that they cannot or do not want to sell themselves (see the discussion below on price discrimination). Smaller websites ordinarily do not have enough volume to support a sales force. They often rely on an advertising network which may also provide the necessary technology. For example, a publisher can paste html code supplied by the advertising network into the part of the webpage the publisher wants to sell; that code will retrieve and insert an advertisement.

There are at least three main sources of supply of online advertising inventory, each of which results in different methods for selling advertising.

First, search engines generate search-results pages. Search engines need to enable users to find what they are looking for quickly and to move from the search results page to the desired webpage. In the late 1990s, search engines struggled to find the right balance between providing valuable search results to attract eyeballs and selling advertisers access to these eyeballs. Most ended up dividing the search results page into the "organic search results" that are based on the relevance of the web page to the keywords entered by the user; and the "paid search results" which are clearly demarcated text advertisements that also look like search results. Although organic search results are valuable to advertisers,[3] search engine providers do not charge advertisers for these listings. Instead, advertisers often hire "search engine optimization" companies, such as Performics, to increase their rankings in the search results. Each page typically has around ten slots available for a paid search advertisement. Advertisers bid on a cost-per-click for these slots and the search provider allocates the slots, roughly speaking, on the basis of expected revenue it will receive—that is, cost-per-click times expected clicks) (Evans, 2008; Varian, 2007). To maximize revenues from the scarce space, the search engines can use the cost-per-click bids and the expected number of clicks that the ads will receive to allocate the spots. Projecting the number of clicks and the effects of different allocation mechanisms is a difficult problem; the various search engine providers have solved that problem to varying

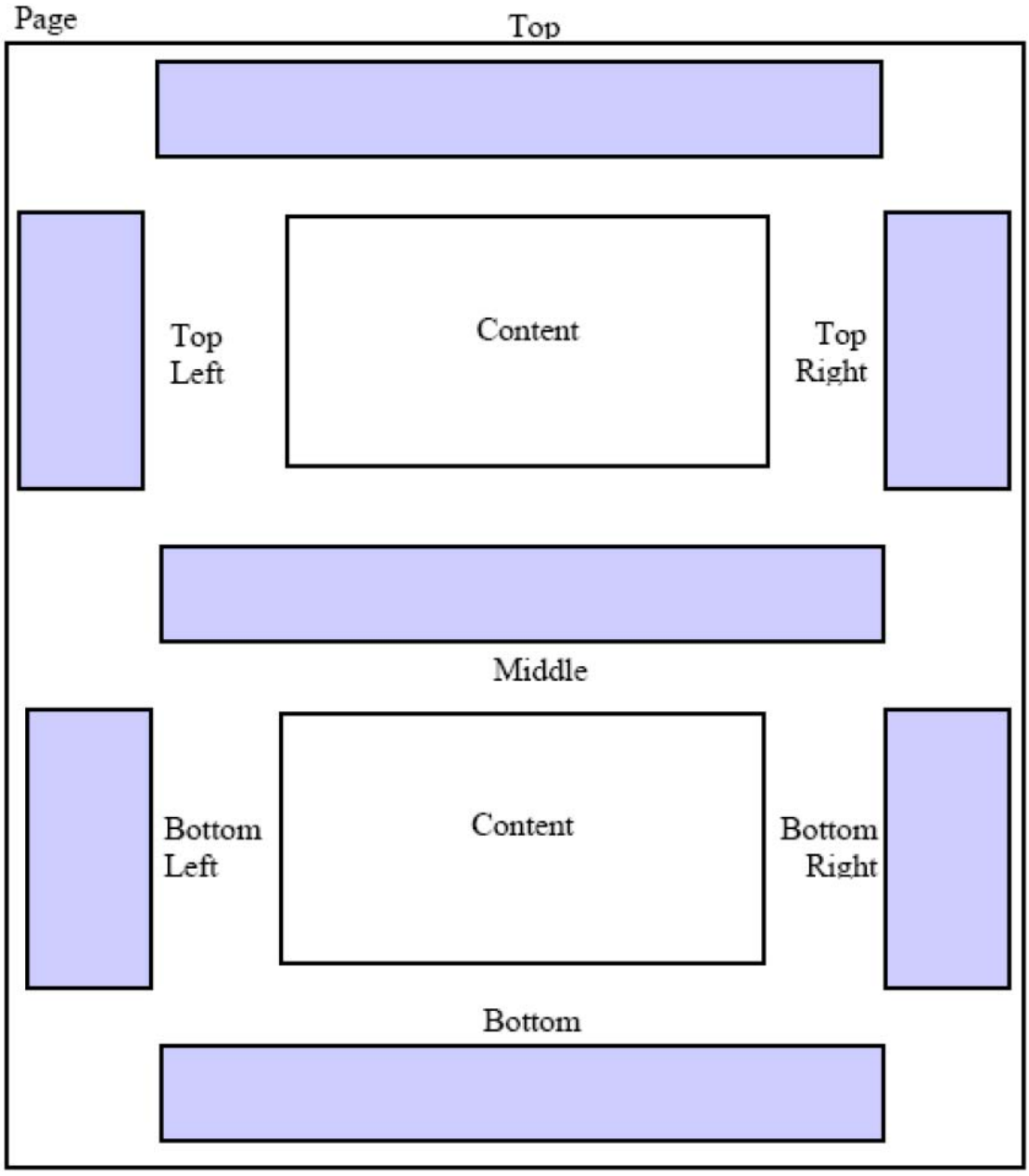
[3] Search engines can be viewed as (at least) three-sided platforms based on third-party content obtained from the web, users looking for this content, and advertisers who seek access to these users. In principle, search engines could charge third-party content providers for the indexing and listing services made available but thus far have generally chosen not to. In March 2004 Yahoo launched a paid inclusion program that guaranteed listings on the Yahoo! search engine for commercial websites in return for payment. This scheme was not popular with website marketers or the public and was discontinued. Microsoft and AskJeeves charged for inclusion for a time but also discontinued this practice.

degrees and their relative success in doing so explains in part differences in the revenue they receive for each search conducted (Evans, 2008).

Online media sites provide content that is broadly similar to what consumers get from traditional media. In fact, many traditional media companies have established web sites which use some material that is also provided through offline channels. Prominent examples include cnn.com, nytimes.com, mtv.com, and cosmopolitan.com. Other sites such as Yahoo! redeploy content from a variety of sources such as newswire services. Finally, some sites, such as youtube.com and drudgereport.com, provide content only online and often do so innovatively. With the exception of the video sites, these sites allocate portions of their pages to advertisements much like newspaper pages do. They generally sell the ads on a cost-per-mille basis—that is, based on how many eyeballs see their pages—through their own sales team and through advertising networks.

Figure 3 provides a sample layout: as with newspapers ads, different spots are perceived as more valuable because they are likely to receive more attention from consumers. Conversations with knowledgeable industry participants indicate that ads in the top half of the page garner a cost-per-mille of around $12.50 while ads in the bottom half of the page realize about half of that. Banners and skyscraper ads typically go for more than $12.50 cost-per-mille. The more desirable space tends to be sold directly, while the less desirable space tends to be sold through advertising networks. These ad networks pay between 15 and 45 percent of the cost-per-mille for a display ad on the top half of the page depending on the quality of the space.

Figure 3. Sample Layout of Content and Advertising on Web Page



People go to social networking sites to obtain updates on what their friends are doing, to update their own pages, and through these and other activities to communicate with their friends. These sites have allocated some space for advertising and have sold this inventory to advertisers. This space is sometime known as the “dead zone” because of the lack of attention that social networking users pay to it. The average cost-per-mille payments to social networking sites are

often less than $0.50. The social networking sites, and on-line advertising businesses, are working on advertising methods that work more effectively with social networking communities. Google, for example, has developed a technology that makes it possible for advertisers to identify and target "influencers" in social networking communities to distribute messages (Helft, 2008). Whether social networking sites can achieve cost-per-mille payments for their viewers that are comparable to other types of on-line advertising remains to be seen. The promise of advertising on social networking websites is that word-of-mouth referrals are the primary influence on purchase decisions (BIGresearch, Simultaneous Media Usage Study (SIMM12), June 2008), and perhaps online communities can be used to create a source for such referrals.

The supply of advertising inventory is highly heterogeneous. It differs in size, the likelihood that consumers will pay attention to it, and the characteristics of the viewers. Not surprisingly, the price that advertisers pay per thousand views varies from a few cents to several hundred dollars in the case of high-income professionals. (This heterogeneity and price distribution is also true for traditional advertising.) Controlling for quality, however, suppliers of advertising engage in extensive "value-based pricing"—which economists call price discrimination.

The search-based advertising platforms, in principle, use second-price auctions to allocate slots and in this way seek to extract higher payments from those willing to pay more (Varian, 2007; see also Edelman et. al., 2007). Indeed, we might expect that the rents earned from the advertiser side would be bid away, at least partly, on the viewer side through competition among platforms (Rochet and Tirole, 2003; Armstrong, 2006), including through explicit subsidies to viewers to join the platform.[4] That has happened to a degree. Microsoft adopted some mechanisms for providing incentives to viewers in 2008; for instance, the Windows Live search site has a button labeled "Search a lot, Earn a lot" which describes incentives for searching that include free Xbox, Microsoft software, frequent flier miles, cash back and more (see

[4] In general, multi-sided platforms can have profit-maximizing equilibrium price structures in which one or more sides have zero or negative prices (Rochet and Tirole, 2006). In the case of search-based advertising platforms the pricing on the advertiser side is fixed insofar as the platform adopts the standard auctions approach. These platforms compete, however, in a number of dimensions including the amount and quality of the search results provided to the users and the ease of use of the platform for users and advertisers. Such competition is similar to free television which competes through the attractiveness of the content rather than cash transfers to viewers. The search-based advertising platforms can dissipate the rents from the second-price auctions of advertising space spending on research and development and other expenditures that improve quality for users and advertisers. They can also dissipate it through distribution deals such as those discussed in the text.

<http://www.live.com/?form=MXCA00&kwid=019409a179d80c4ba7fe55c739b4f11c>, visited on November 28, 2008). Yahoo! has also entered into incentive arrangements for people to download toolbars that rely on its search engine. For example, Yahoo shares revenue with companies that get people to search with Yahoo and those companies in turn provide benefits—such as donations to charity—to individuals who download a toolbar that contains the Yahoo search feature (see <http://affiliates.freecause.com/index.cgi?action=about>, visited on November 28, 2008). Google has not followed suit. As of 2008, there does not appear to be robust price competition to persuade searchers to use alternative engines available to them. A different kind of competition for attention does take place. Google, Microsoft and Yahoo! compete to become the default search engine on the browser, on various tool bars that are distributed, and in publisher web sites. Although consumers can readily change these default settings the search engine providers presumably pay for these because enough consumers stick with the default. These deals provide incentives to entities that can provide search engine defaults for their users to compete harder to these users by providing greater quality.

Online publishers engage in price discrimination as well. This practice is similar to other business-to-business transactions which are often characterized by individual negotiations, and the online practices are similar to the offline practices. In both cases, heterogeneous supply is being matched up with heterogeneous demand through bilateral exchanges and with limited public information. Media companies can take space they do not choose to sell directly and make it available to intermediaries that sell it indirectly. Larger online publishers typically have contracts with several advertising networks and have technology that selects the highest price for inventory in more or less real time. Online advertising networks are discussed in more detail below.

Demand for Online Advertising Space

Businesses spend money on advertising because it helps them sell products to consumers. Economists have developed a variety of models concerning the role of advertising, but most of that work focuses on how advertising might affect demand. There is little empirical work that assesses the extent to which advertising spending reduces transactions costs by providing

valuable information (including quality signals) to consumers and matching buyers and sellers; provides disinformation that harms consumers; or is designed to alter preferences. In addition, few studies have examined the demand for advertising from the vantage-point of how the advertisers decide how much to spend or how to allocate that spending across different forms of advertising (Silk et al., 2002). Existing work together with anecdotal information suggest that advertisers—and their agents—determine an overall advertising budget, allocate that budget among different methods (such as brand advertising on national television) for achieving the objectives of an advertising campaign, and select various alternative advertising outlets for spending their dollars. Traditional methods have included placing ads on different media such as television, radio, newspapers, magazines, billboards, and directories and engaging in sales as mail and telemarketing. Each method draws upon many suppliers of advertising inventory, which vary in their coverage of the population as well as the characteristics of those covered.

Advertisers typically develop "campaigns," which utilize a mixture of these methods and suppliers, to achieve objectives which may range from increasing sales of an existing product, to introducing a new one, to affecting the image of the company or brand. They base their decisions on the level and allocation of their budgets on formal or informal analyses of the rate of return on investment (Duboff, 2007). For these ad campaigns, the different advertising methods can be substitutes to the extent they provide alternative ways of delivering messages to an audience and complements to the extent they can reinforce each other ("The Medium Is The Massages," 2002). Berndt et al. (2002) find that 57 percent of the 28 pairs of the cross-elasticities they estimated indicated the methods were, on net, substitutes and the remainder were complements--although typically weak ones.

The emergence of online advertising has provided another type of media for advertisers. The online methods of advertising, however, usually have close counterparts offline. A GM Corvette ad on cnn.com is not visually that different from a GM Corvette ad in *USA Today* and GM will pay for both ads based on the number of viewers. A Yahoo! ad for pizza restaurants on the Upper West Side of Manhattan is not that different from an ad for a pizza restaurant in the Manhattan "Yellow Pages" telephone directory. Hardcopy mail and e-mail solicitations for vacuum cleaners are similar, and both entail payment based on results. Of course, potentially important differences may arise in the value received by the advertiser from the comparable online and offline message. Online, the GM ad viewer can click through to a website; someone

from out-of-town can find the pizza restaurant on Yahoo; and the e-mail solicitation for vacuum cleaners can take a buyer to a website to purchase the vacuum and have it shipped.

Different methods of online advertising are potentially substitutes or complements both with each other and with other forms of advertising. For example, if an advertiser wants to reach a large number of individuals to introduce a new product, it can buy a banner ad on the Yahoo! home page which has 48 million visitors a day (based on comScore Media Metrix report for February 2008) or it can buy a couple of 30-second television spots on Fox TV's *American Idol* which had more than 20 million viewers for its early 2008 episodes. A typical advertiser will place display ads on multiple web sites as well as several television shows to reach a large audience. However, as these methods are all designed to reach large numbers of people, they are probably substitutes at the margin. The advertiser might complement this campaign by buying keywords on one or more of the major search engines so that consumers that see the product can search for it online, learn more about it, and possibly purchase it. Of course, investigating the fine structure of demand requires more than such ruminations. The extent to which different methods of offline and online advertising substitute or complement for each other depends on the nature of the particular campaign, the objectives the advertiser seeks to pursue, the aggregation across advertisers of many possibly varying demand relationships, and other factors. The net degree of substitution or complementarities between different advertising methods is an open empirical question.

Advertisers typically hire firms to design and execute advertising campaigns. Although these firms often have relationships through a conglomerate, such as WPP, they have become more specialized over time (Berndt et al., 2008). Increasingly one firm does the creative work and plans the campaign while another firm engages in buying and placing media. While some firms have arisen that specialize in online advertising, most creative work and media buying is performed by advertising firms that manage both offline and online work for advertisers. Within the online part of the business, advertisers or their agents also purchase various technologies for distributing online advertisements to suppliers of advertising inventory and measuring the success of online campaigns.

Intermediation between the Advertising Buy and Sell Sides

The advertising industry has to solve a massive matching problem between businesses and consumers. A large number of advertisers want to deliver multiple messages to a large number of consumers. Indeed, advertising agencies were formed in the mid-nineteenth century to deal with the coordination of supply and demand among businesses that wanted to advertise outside their locality and the daily and weekly newspapers (Pope, 1983).

The online advertising industry has developed a variety of technologies and business methods for solving this matching problem. The most innovative and best-known involve "search-based advertising," in which advertisers and consumers are matched based on the "keywords" that people enter into search engines. Consumers are attracted to the search engine because they are interested in content on the web. Advertisers use these keywords as proxies for the likelihood that consumers would be interested receiving a message that might lead to a sale. Auction methods are then used to allocate the advertising inventory to the businesses that are willing to pay most for most clicks, which in turn depends on the amount they are willing to pay and the number of clicks their ads will receive (Evans, 2008).

Other innovations are occurring in the buying and selling of display advertising on publisher websites. As of 2008, the preponderance of display advertising (measured by revenues) was bought and sold the old-fashioned way. Large online publishers have salespeople who sell their inventory to media buyers for large advertisers. That method of selling advertising space is only viable when there are enough people viewing that space—and thus enough expected revenue—to warrant the cost of salespeople calling on individual advertisers. Computer-based methods for matching the supply of advertising inventory and the demand for advertising inventory have made it possible for smaller sites to sell their inventory profitably. These methods also enable larger publishers to sell inventory that their salespeople have not sold. A number of advertising networks have arisen which broker multilateral exchanges between publishers and advertisers. These advertising networks enter into agreements with publishers to sell available advertising and with advertisers to deliver viewers with specified characteristics in return for a fee. Some of these networks provide behaviorally targeted ads discussed below although many place ads based on crude demographic information. Google has developed a

computerized solution that has proved economic for many small web sites such as blogs. Google's Content Network supplies advertising inventory from "hundreds of thousands" of web sites that have joined its network (according to <https://adwords.google.com/select/afc.html?sourceid=awo&subid=en-us-et-awhp_related&hl=en_US>, visited December 7, 2008). In what is known as "contextual advertising," Google's advertising network auctions keywords that appear on the web page of participating publishers and inserts ads from participating advertisers based on the appearance of those keywords and possibly some other characteristics of the website. The publisher pastes html code into its webpage to receive and display the ad, while the advertiser typically uses an auction and advertising campaign management tool that is bundled into the software package it uses for search campaigns. (Sears, 2005). Many larger websites also use Google's contextual advertising for some of their less desirable space.

. It appears likely that online advertising provides two potentially significant economic efficiencies. First, a promising conjecture is that online advertising allows the economy to reduce the amount of resources devoted to creating content for aggregating and sorting potential buyers. Society may not need to invest as much in magazines, newspapers, and other media whose main purpose is aggregating the right eyeballs for advertisers. Although consumers value that content they have not had to pay for its cost of production. Second, online advertising likely increases the accuracy of the match between the buyer and the seller. The seller has greater ability to target consumers that are likely to buy and the consumer is more likely to receive useful messages and less likely to receive time-consuming but irrelevant messages.

In both cases one can argue that there are some losses that also need to be considered. The news media gathers and reports news through professional journalists in some cases scattered through the world including war zones. One can argue that the news media provides an important public service in a democratic society and that its value exceeds what individuals or advertisers may pay for it. Moreover, as with any technological change some people gain and others lose. Those who strongly prefer the touch and feel of newspapers will lose if not enough people are willing to support the costs of these newspapers. In addition, online advertising may provide more efficient matching and delivery of ads but that begs the longstanding question of whether advertising is providing people with valuable information that helps them make better

buying decisions, or whether it is getting people to buy based on deceptive information or by persuading them to do things that they will soon regret.

Issues in Industry Evolution

Online advertising is one of those "gales of creative destruction" that will reshape several industries and radically change traditional ways of delivering advertising messages from sellers to prospective buyers.

Behavioral Targeting and Data Analytics

As noted earlier it is possible for online entities to gather data on what people have done online including what they have searched for, what web sites they have browsed, and perhaps even what they have purchased online. Those data together with other information on these people can be used to target advertisements to people based on their behavior.

For example, an advertising intermediary could help an automobile insurer target individuals who probably have good risk profiles, who may be buying an expensive new car, and who are therefore likely to in the market for automobile insurance. The intermediary could infer that the individual may have bought new expensive car from the fact that the individual has been browsing particular websites that people go to when they are going to purchase a luxury automobile. The intermediary might also be able to infer from online behavior that the individual falls into a low-risk insurance category. It could infer from a user's IP address and browsing behavior that the user is probably a woman (from browsing behavior) who lives in a well-off suburb (from the IP address), in a region with low accident and theft rates (from the IP address), and is over the age of 25 (from browsing behavior). The intermediary might identify potential sales targets by just using simple screening methods such as these or may use more sophisticated statistical methods to predict the sort of the prospects the insurance company is looking for. Either way the advertising intermediary can use these methods to determine whether a particular individual who is browsing a website at a particular moment has exhibited the web browsing behaviors and personal characteristics that make that person a good target for an ad. It can make

that decision almost instantaneously and then insert an ad into advertising space on the page that the target is viewing. The advertiser would typically pay a premium over standard online advertising rates for views by these targeted individuals because the likelihood that they will "convert" the view by this "qualified prospect" into a sale and thus their expected profits is higher.

Although behavioral targeting is an area of intense innovation, as of 2009 only a small portion of the advertising revenue earned by publishers results from selling these sorts of behaviorally targeted advertisements.[5] Two factors limit the current deployment of this seemingly efficient method of advertising.

First, since behavioral targeting narrows the group of people that see an advertisement the likelihood that these individuals will ultimately purchase the product has to be high enough to offset the reduction in the number of people that view that advertisement. On average only about 1 out of 400 viewers click on a given ad (Marketing Sherpa, 2008) and only a fraction of those viewers purchase the product. Unless behavioral targeting is sufficiently precise advertisers may prefer to reach a larger group of individuals all else equal. Reaching 10,000 people of whom 1/1000 (or 10) will ultimately purchase a product is better than reaching 2,000 people of whom 1/500 (4) will ultimately purchase the product. There is a tradeoff between precision and reach. In this example, all else equal, a behavioral screen that targeted a fifth of the potential population would have to identify people that were more than five times as likely to buy to be better than targeting everyone. Precision is limited by the amount and quality of data that are available. (In addition, behavioral targeting is not relevant for brand advertising that is generally aimed at a broad audience to influence their views on a company or a product rather than to make a direct sale.)

Second, the advertising platform that implements a behavioral targeting campaign must have access to a large enough universe of viewers to find enough candidates to make the campaign worthwhile to the advertiser. There are fixed costs of designing and executing advertising campaigns; the advertiser needs to make enough sales to recover these costs and

[5] Behaviorally targeted advertising is mainly used by advertising networks. Advertisements placed by advertising networks account for a small portion of the advertisements on publisher web sites and only a portion of the advertisements placed by advertising networks rely on behavioral targeting. Based on discussions with industry participants the fraction of revenue for advertisements placed by advertising networks is small and behavioral targeting smaller still.

make a return. Suppose that it costs $10,000 to design a campaign and the expected incremental profit from each sale that results from this campaign is $10. Then the campaign would have to generate an expected 1000 conversions to recover the fixed costs. If only 1 out of 1000 consumers that are exposed to an ad is converted to a sale, the campaign would need to reach at least 1,000,000 individuals for it to break even. Consider a behavioral targeting campaign that converts 1 out of 500 consumers by targeting the 20 percent of the potential universe of people that are the most likely buyers. To yield 1000 conversions that campaign would need to reach 2,500,000 people. The total sample needed depends generally on the conversion rate and the targeting rates which depend on each other. Many advertising networks are not large enough to engage in highly refined behavioral targeting while some of the largest advertising platforms have not yet deployed highly refined targeting.

Several developments may increase the use of behavioral targeting methods. With improvements in predictive techniques and the availability of data on viewers behavioral targeting would become more precise and advertisers would increasingly prefer targeting to reach. If advertising networks that use behavioral targeting methods increase their scale, or if larger advertising platforms increasingly deploy behavioral targeting and data collection methods, they will obtain enough viewers to make behavioral campaigns economically efficient. Privacy concerns discussed below could limit the development of behavioral targeting. Consumers may resist having advertising platforms collect detailed information about their browsing behavior and government regulations may limit the ability of advertising intermediaries to collect these data.

Electronic Exchanges

Online publishers rely on advertising networks to sell inventory that they have not succeeded in selling directly, and also as a substitute for direct selling in some cases. Some advertising networks enter into deals with online publications to sell some of their inventory to advertisers. The advertising network then sells this space to advertisers. Some networks might sell the advertiser the ability to deliver their ads into a variety of similarly situated advertising inventory such as financial publications without guaranteeing which ones; others might sell the advertiser the ability to deliver ads into selected publications; and still others might sell the

advertiser the ability to target particular types of users. Some advertising networks focus on broad publications while others concentrate on particular niches. Aside from the ability to serve ads electronically, these exchanges follow roughly the same business model as the nineteenth-century advertising agencies that brokered advertising space (Pope, 1983).

Several firms have developed or are proposing to develop electronic exchanges (for one example, see the discussion the DoubleClick Advertising Exchange at <http://www.doubleclick.com/products/advertisingexchange/index.aspx>, visited on November 29, 2008). These exchanges connect web-based publishers (or their agents) that would make their advertising inventory available and advertisers (or their agents) that would want to purchase this inventory. Advertising networks that have an excess supply or demand of advertising inventory could also participate. The advertising inventory would be auctioned off in real time and the exchange then handles the delivery of the advertising from the advertiser to the publisher. No data on the size of these exchanges is available, but based on discussions with individuals in the online advertising business, as of the end of 2008 it does not appear that the existing exchanges have achieved a critical mass of liquidity that would enable them to sustain themselves. Indeed, few such business-to-business exchanges have achieved critical mass in any area of business—most have died (Evans, 2009). It remains to be seen whether the advertising exchanges will ultimately face a similar fate. (Harris, 2002 discusses the role of liquidity for an exchange and Evans and Schmalensee,2009 discuss the role of critical mass for multi-sided platforms.)

Creative Destruction and the Migration of Offline to Online

Traditional advertising sustains a complex ecosystem of businesses. A wide range of media entities earn significant portions—sometimes all—of their revenues from the sale of advertising inventory. These include newspapers, magazines, free television, free radio, billboards, and yellow pages. In turn, these businesses support a variety of content generation businesses, including television production companies and musicians. Diverse other businesses work with advertisers including advertising agencies, media buyers, and audience measurement firms. Every business in this ecosystem felt a breeze as on-line advertising arrived in the mid-

1990s, and then felt a stiff wind by the early 2000s as the online advertising industry came together.

Online advertising methods pose a serious threat to traditional methods for several reasons. First, they increase the efficiency of matching buyers and sellers and delivering advertising messages to the buyers. In the long run one would expect that this will reduce the economic importance of traditional intermediaries such as advertising agencies, media buyers and sellers, and direct sales forces.

Second, they increase the supply of advertising inventory significantly. By providing a method for earning revenue from attracting viewers, online advertising attracts the entry of content providers that supply advertising inventory. During the 2000s that has included of user-generated video sites such as YouTube, social networking sites such as Facebook, and blogs such as HuntingtonPost. Americans viewed more than 458 billion web pages in 2007, each of which could have carried advertising and many of which did. The aggregate number of page views increased at an average rate of 21 percent between February 2004 and February 2008 (according to ComScore Media Metrix). There are low financial barriers to the formation of these sites as a result of web technologies. This increased supply of advertising inventory puts downward pressure on advertising rates, promises to reduce the returns that traditional media can get from advertising, and therefore potentially reduces the quality-adjusted supply of content by traditional media. (The increase in the quality of advertising could increase or decrease the demand by advertisers which could therefore have a partly offsetting effect on rates.)

Third, online advertising increases the supply of online content which provides a substitute for traditional content. The potential returns from online advertising encourage entities such as Yahoo! and MSN, as well as traditional media, to present various kinds of content online that consumers used to consume mainly offline. In addition, of course, viewers are moving from offline to online media because, as with the move from radio to television, they simply like the content better along certain dimension, which can include the ease, flexibility, and interactive dimensions of access. Thus far the evidence shows that as a result of online content consumers have substituted away from radio and newspaper content but not television content. The US Census reports that persons above 12 years of age spend 32% more time

watching that cable and satellite television than they did in 2001. The usage of radio and traditional newspapers has declined by 3% and 15%, respectively.[6]

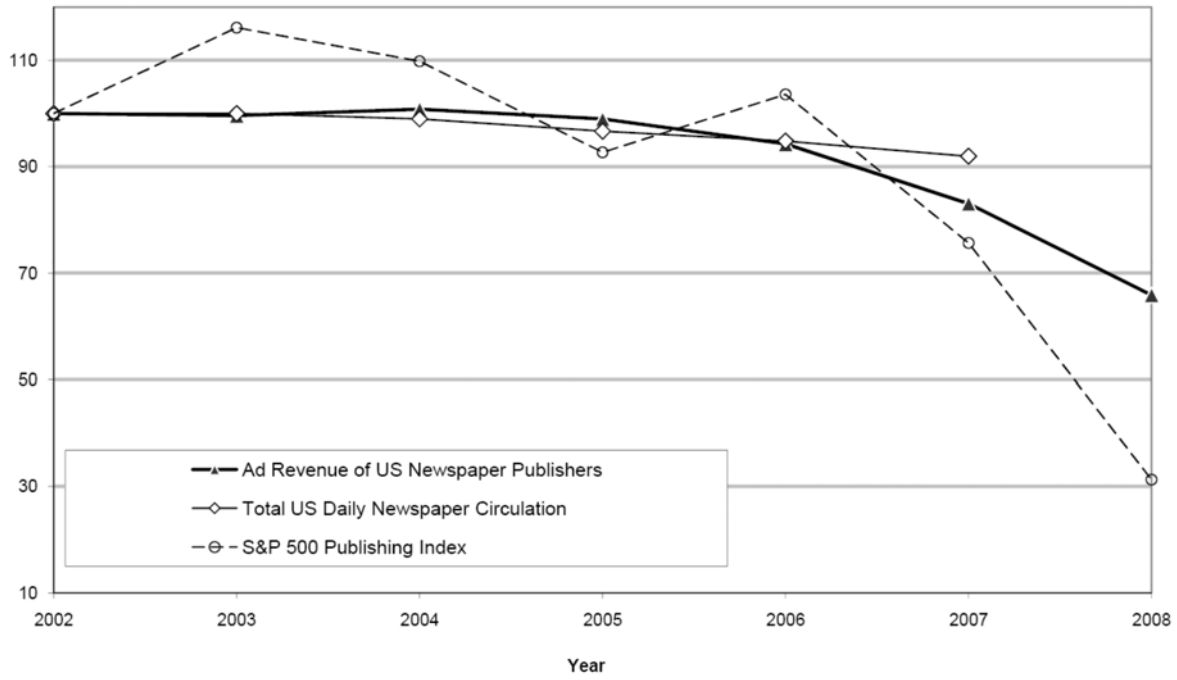
These trends are likely to accelerate as more content is available either online or through other technologies that enable the sellers of advertising inventory to employ online methods. Some traditional media may make a fairly smooth transition to the online world. The television industry could change its delivery method so that programming is delivered primarily through internet protocols—what is known as IPTV—and implement online technologies to serve ads. Verizon's FiOS Television, which is based on internet technologies, had 2.5 million Internet subscribers and 1.9 million television customers in the United States as of December 31, 2008[7]. The production and programming sides of the business could operate much like they do today although many of the business methods, and assorted institutions, for selling and delivering advertising would change. The same is true for radio which is already being delivered over the internet. One cannot consume internet radio on the morning drive to work at the moment but that may change once there is more extensive wireless internet coverage and cars become equipped with internet-enabled electronics.

The forces of creative destruction have hit the newspaper industry the hardest and the earliest. The industry is in free fall as a result of the self-reinforcing migration of readers and advertisers online. Figure 4 shows the circulation for all U.S. daily newspapers, their advertising revenues, and the market capitalizations of the Standard & Poor's 500 Publishing Index--all indexed to 100 in 2002. There has been a precipitous drop in circulation and advertising revenue and the S&P 500 indicates that the market expects dramatic reductions in the future profit stream of the newspaper industry. As mentioned earlier several major daily newspapers in the United States have closed their doors. Although many newspapers have developed web versions that attract significant number of viewers, their increased online advertising revenues have only partly compensated for their loss of traditional advertising revenues. As radio and television move to internet-enabled platforms they could find the same decline in advertising revenues with the same impact on the economics of providing traditional content.

6 US Census Bureau, Table 1089: Media Usage and Consumer Spending: 2001 to 2011, http://www.census.gov/compendia/statab/tables/09s1089.pdf.

[7] "Verizon FiOS-Fact Sheet," Verizon News Center (available at http://newscenter.verizon.com/kit/fios-symmetrical-internet-service/all-about-fios.html, last visited on March 24, 2009).

Figure 4. Newspaper Industry Performance Measures



Ad revenue and publishing index are adjusted for inflation, all quantities indexed to 2002 base year. In 2002 ad revenue of all US newspapers equaled $44 billion, and the total US daily newspaper circulation was 50.7 million.
S&P 500 Publisher Index is composed of the prices of the common stocks of the following companies: Gannett Co., Inc., The McGraw-Hill Companies, Inc., Meredith Corporation, The New York Times Company, and Washington Post Company. It is weighted by market cap. In 2002, the total market cap of these companies was $44.1 billion.
Source: **Advertising Age, Newspaper Association of America, Washington Post Company Annual Reports.**

The industrial structure of the online advertising industry could evolve in a variety of ways. One possibility is that the industry will have a highly concentrated set of intermediaries at its center, with many content providers around this core. This result would be akin to the U.S. stock exchange system which has 5 major exchanges that account for 92 percent of transaction volume.[8] Another possibility is that the industry will have many intermediaries at its center. Some of the intermediaries will focus on mass advertising while others will focus on niches. The ultimate structure depends on the relative importance of several factors: the strength of indirect network effects and scale economies on one side, and the possible benefits of specialization of knowledge in certain areas.

[8] Data as reported by Arcavision. Note that the 5 exchanges are associated with either Nasdaq or NYSE Euronext. The shares of each of the five exchanges are: NASDAQ-29.9%, NASDAQ TRF-19.8%,NYSE Arca 18.1%, NYSE 17% and NYSE TRF 7%.

The Privacy Dilemma

Participants in the online advertising industry collect and store a great deal of information about people who use the internet. Search-engine providers capture every search a user does with their search engines and the websites they visited. They store these data in a way that enable them to identify the individual IP address that generated the data for several months. Many participants in the online advertising industry also insert "tracking cookies" into the computers of users with whom they have had contact. These cookies enable the provider that inserted them to track the web sites that an individual has visited. These providers may also capture these data and store them along with the IP address that identifies the user. "Web beacons" are code on web pages that determine that an individual has opened a page and captures the IP address of that individual. These beacons can track the activity of the individual on a site. The traditional advertising industry also collects data on people and uses that for targeted mailings and telephone calls. The online advertising industry collects vastly more data.

The providers that collect these data use them for various purposes. In some cases they employ them to conduct research to improve their products. Google's privacy page, for example, says that it uses them to conduct research on common spelling mistakes and to assess the effectiveness of the ad rankings. Past browsing behavior is also critical to the implementation of the behavioral targeting strategies described above. These data can be used to infer general characteristics of individuals such as their gender and interest in sports as well as their present buying interests such as whether they are planning a vacation.

These detailed data on browsing are valuable to online advertising industry providers. They enable these providers to provide higher quality prospects to advertisers and to therefore charge more for the advertising inventory they supply. They also possibly provide more valuable advertisements to users who in turn will be more likely to visit web sites that present advertisements that are more tailored to the needs of the user. Given that a web site is going to display an advertisement consumers might prefer that the advertisement be more relevant than not.

The collection of these data has proved controversial, however, and raises some delicate public policy issues. Consumer privacy advocates and regulators have criticized the search-

engine providers for capturing and storing data (Dye 2009). In response, these providers have agreed to reduce the length of time for which they store data with individual identifiers. Google, for example, has reduced this period from two years to nine months.[9] The collection of data, as well as behavioral targeting, has attracted lawsuits and legislative inquiries. NebuAd and Phorm are good examples. The two behavioral targeting firms enlisted Internet Service Providers into their advertising network and used browsing data from these Internet Service Providers to target advertisements. They quickly became the subject of legislative inquiries in the United States and the United Kingdom and many of the Internet Service Providers withdrew as a result of the controversy.[10]

The use of personal data for targeted advertising raises several public policy issues. If people had ownership over information about themselves, and there was a competitive market for it, they could decide whether to sell it to an online advertising business. In making this decision, people could take into account the value of receiving possibly more relevant ads, as well as any other compensation they might get. They would also take into account any costs from the possible leakage of their private information.

To a degree, consumers have some control over their private information. A user can choose not to use websites that insert "cookies" that collect data on her machine (or choose to delete such "cookies" on a regular basis). Web browsers have increasingly provided mechanisms for consumers to control the retention of information on their browsing history and manage their cookies. Reviews of the recently released browsers in the market, IE 8.0 and Google Chrome 2.0, emphasize new features like private browsing and search suggestions.[11] To the extent the consumers exercise these choices they put competitive pressure on online advertisers to account for the value that consumers place on data about themselves. Consumers can also avoid websites and web services scan and store personal content. Some users may avoid Google Gmail because it scans and records the content of emails while others may value the targeted ads that result from Google's ability to examine the content of the emails.

[9] "Google to dump user data earlier," BBC News (September 9, 2008), available at <http://news.bbc.co.uk/2/hi/technology/7605801.stm>
[10] See Paul (2008).
[11] < http://www.microsoft.com/windows/internet-explorer/features/overview.aspx?tabid=1&catid=1>, <http://www.google.com/chrome/intl/en/features.html#>

Nevertheless, three potential problems arise that could warrant the consideration of government intervention into the treatment of privacy by the online advertising industry.

First, there is the usual imperfect information problem that is often used to justify consumer protection efforts (Stiglitz and Walsh, 2002). Consumers may not know that information is being collected and stored. It appears likely that few consumers knew that Google stored each user's search history, including details sufficient to identify the IP address of the user's computer, for two years before this was the subject of news stories (for example, "Google's growth raises privacy concerns," 2008). Even with the publication it remains unclear how much consumers know about the extent to which various online advertising related businesses collect information on them.

Second, consumers may agree (either tacitly or explicitly) to provide private information without anticipating that this information would be sold to other vendors who might combine it with other information about them. For example, a consumer may feel differently about providing search data associated with her IP address to a search engine provider if she knew the search engine provider would sell the data to another vendor that had figured out a way to associate her IP with her personal information including name, address, and telephone number.

Third, competition among advertising platforms may not necessarily result in the optimal provision of privacy. When there is perfect information competition can usually be relied on to yield the optimal provision of quality to the consumer. Online advertising intermediaries are multi-sided platforms that compete simultaneously for advertisers and viewers. Whether this competition results in the optimal provision of privacy, and the extent to which it would do so in a highly concentrated market, would need to be investigated carefully (see Rochet and Tirole, 2006) for an analysis of similar issues in credit cards).

In principle, of course, consumers could learn about the collection and use of their information. But this incurs costs. Likewise, the online advertising businesses could increase efforts to engage in transparent contracts with consumers. But this incurs costs, too. The critical public policy question is how property rights—including those enforced through regulation—over private data should be assigned.

Public policymakers in the United States and the European Community are grappling with these issues (Federal Trade Commission, 2006, 2007; European Commission, 2008). Too

stringent regulations could harm consumers. After all, the online advertising industry benefits consumers in several ways. It increases the likelihood that they will receive relevant ads and decreases the likelihood that they will waste time on irrelevant ads. Moreover, it promises to reduce the costs of advertising to businesses, and some or all of these costs would be passed on to consumers in the form of lower prices. On the other side, overly lenient regulations could also harm consumers. Consumers could incur the costs of having private information disclosed and potentially misused, and incur the costs of reducing their use of the web because of concerns over privacy. Regardless of whether it their private information is disclosed consumers may not like receiving ads that reflect too much knowledge about them even if it is only a software program on a remote server that has that knowledge.

Resolving the privacy dilemma is important for innovation in behavioral targeting. Innovators will benefit from knowing what information they can collect and how they can use it without risking lawsuits, being pilloried in the press, and being hauled in front of Congress. Consumers will benefit from balancing the benefits of receiving relevant ads against the cost of losing valuable privacy.

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References

Arango, Tim. 2008. “Cable Firms Join Forces to Attract Focused Ads,” *New York Times* (March 10).

Arcavision. “Exchange Volume Summary-1/1/2008-12/31/2008.” Accessed on April 2, 2009.

Anderson, Simon P., Jean J. Gabszewicz**.** 2005. “The Media and Advertising: A Tale of Two-Sided Markets.” *CEPR Discussion Paper No. 5223*.

Armstrong, Mark. 2006. “Competition in Two-Sided Markets.” *RAND Journal of Economics***,** 37 (3), 668-691**.**

Bagwell, Kyle. 2002. “The Economic Analysis of Advertising.” mimeo, Columbia University.

Berndt, Ernst, Mohammad Arzaghi, James C. Davis, Alvin J. Silk. 2008. “Economic Factors Underlying the Unbundling of Advertising Agency Services.” *NBER Working Paper No. W14345*.

BIGresearch, Simultaneous Media Usage Study (SIMM12), Media Influence to Purchase & New Media Usage –Voters, June 2008.

Blodget, Henry**.** 2008. “Newspapers' Fab 2007: $11 Billion of Market Value Vaporized.” Silicon Alley Insider. (January 2), at <http://www.alleyinsider.com/2008/1/newspapers_11_billion_of_market_value_vaporized_in_2007>.

Chiaravalle, Bill and Barbara Schenck. 2006. *Branding for Dummies.* John Wiley & Sons.

ComScore Press Release. 2008. “U.S. Search Engines Rankings.” (November 26), at <http://www.marketwatch.com/news/story/comScore-Releases-October-2008-US/story.aspx?guid={FE165F0B-907D-4869-BDC9-379F061AEB6E}>.

Duboff, Robert S. 2007. *ROI for Marketing: Balancing Accountability with Long-Term Needs.* New York: Association of National Advertisers.

Dye, Jessica. 2009. “Consumer Privacy Advocates Seek Search Engine Solution.” EContent (March Issue), at <http://www.econtentmag.com/Articles/News/News-Feature/Consumer-Privacy-Advocates--Seek-Search-Engine-Solution-52679.htm>.

Edelman B., Michael Ostrovsky, and Michael Schwarz. 2007. “Internet Advertising and the Generalized Price Auction: Selling Billions of Dollars Worth of Keywords.” *American Economic Review,* 97(1), 242-259.

Elliott, Stuart. 2006. “At the Four A’s, a Focus on Getting Stronger.” *New York Times* (April 3), at <http://www.nytimes.com/2006/04/03/business/03adcol.html?pagewanted=print>.

European Commission. 2008.*Opinion on Data Protection Issues Related to Search Engines,* April.

Evans, David S. 2008. "The Economics of the Online Advertising Industry," *Review of Network Economics*, 7(3), pp 359 – 391.

Evans, David S. 2009. “How Catalysts Ignite: The Economics of Platform-Based Start-Ups.” Platforms, Markets and Innovation, A. Gawer, ed., Cheltenham, UK and Northampton, MA, US: Edward Elgar, 2009. Available at SSRN: http://ssrn.com/abstract=1279631.

Evans, David and Richard Schmalensee. 2005. *Paying with Plastic, 2nd Edition: The Digital Revolution in Buying and Borrowing.* Cambridge: The MIT Press.

Evans, David and Richard Schmalensee. 2009. “Platform Failure.” Available at SSRN, http://ssrn.com/abstract=1353502.

Federal Trade Commission Hearing. *Behavioral Advertising: Tracking, Targeting, and Technology.* November 2006.

Federal Trade Commission Release, *Online Behavioral Advertising: Moving the Discussion Forward to Possible Self-Regulatory Principles*. December 2007.

“Google’s growth raises privacy concerns.” 2008. *CNN.com*. November 4.

“GoTo to Overture to YSM-Timeline,” 2005. September 21. bg Theory website, at <http://www.bgtheory.com/blog/goto-to-overture-to-ysm-timeline/>.

Hagel, John and Marc Singer. 1999. *Net Worth*. Cambridge: Harvard Business School Press.

Hallerman, David. 2008. “US Online Advertising: Resilient in a Rough Economy: Summary.” March, available at eMarketer.com, <http://www.emarketer.com/Reports/All/Emarketer_2000488.aspx>.

Harris, Larry. 2002. *Trading and Exchanges: Market Microstructure for Practitioners*. Oxford University Press.

Helft, Miguel. 2008."Google's New Tool Is Meant for Marketers." *The New York Times.* (August 6), at http://www.nytimes.com/2008/08/06/business/media/06adco.html.

"History of Pay Per Click Advertising and Yahoo! Sponsored Search," 2007. November 1. Semvironment.com website at <http://www.semvironment.com/the-history-of-pay-per-click-advertising-and-yahoo-sponsored-search>.

Interactive Advertising Bureau. 2000-2007. Press Releases.

Kaye, Barabara K and Norman Medoff. 2001. *Just A Click Away: Advertising on the Internet.* Massachusetts: Allyn and Bacon.

Lafayette, Jon**.** 2008. "Nielsen Gains Access to Data From Charter's Set-Top Boxes," TVWeek.com. (March 12), at <http://www.tvweek.com/news/2008/03/nielsen_gains_access_to_data_f.php>.

Marketing Sherpa Report. 2008. "Banner Ad Size and Click Rate: Bigger a Bit Better, But It is the Click that Counts," September 16.

"The Medium Is The Massages." 2002. *Adweek,* July 29.

Microsoft Advertising Industry News. 2008. "Spending on Behavioral Targeting Predicted to Increase," September 8. At <http://advertising.microsoft.com/news-events/behavioral-targeting>.

Minton, Stephen**.** 2007. *Worldwide Telecom Spending 2007-2011 Forecast: World Telecom Black Book*. IDC.

O'Hara, Maureen. 1998. *Market Microstructure Theory*. Oxford: Blackwell Publishing Inc.

Paul, Ryan. 2008. "EU calls phoul over ad company Phorm's invasive snooping," Ars Technica (August 15), available at http://arstechnica.com/old/content/2008/08/eu-calls-phoul-over-ad-company-phorms-invasive-snooping.ars.

Pope, Daniel. 1983. *Making of Modern Advertising.* New York, NY: Basic Books.

Rochet, Jean-Charles and Jean. Tirole. 2003. “Platform Competition in Two-Sided Markets.” *Journal of the European Economic Association*, 1(4), 990-1029.

Rochet, Jean-Charles and Jean. Tirole. 2006. “Externalities and Regulation in Card Payment Systems.” *Review of Network Economics* 5(1), 1-14.

Sears, Jay. 2005. “The Evolution of Contextual Advertising,” Upgrade Magazine. (April/May), at <http://www.contextweb.com/pdf/UpgradeMagazine.pdf>.

Silk, Alvin J., Lisa R. Klein and Ernst R. Berndt. 2001. “The Emerging Position of the Internet as an Advertising Medium.” *Netnomics* 3, 129:148.

Silk, Alvin J., Lisa R. Klein and Ernst R. Berndt. 2002. “Intermedia Substitutability and Market Demand by National Advertisers.” *Review of Industrial Organization* 20: 323-348, 2002.

Schumpeter, Joseph. 1942. *Capitalism, Socialism and Democracy.* New York: Harper and Brothers.

Stiglitz, Joseph and Carl Walsh. 2002. *Principles of Microeconomics.* New York: W. W. Norton.

Thaler, Richard H. and Cass R. Sunstein. 2008. *Nudge: Improving Decisions about Health, Wealth, and Happiness.* Yale University Press.

U.S. Department of Commerce**.** 2008. *Quarterly Retail E-Commerce Sales 3rd Quarter 2008,* Press Release (November 19).

Varian, Hal R. 2007. “Position Auctions.” *International Journal of Industrial Organization* 25(6) Winter: 1163-1178.

“Verizon posts in-line 1Q adj eps; wireless biz adds 1.5M customers.” 2008. *Forbes.com.* (April 28), at <http://www.forbes.com/feeds/afx/2008/04/28/afx4939948.html>.

Yahoo Press Release. 2007. “*Yahoo!` s New “SmartAds” Meld Brand and Direct Response Advertising*.” (July 2), at <http://yahoo.client.shareholder.com/PRESS/ReleaseDetail.cfm?ReleaseID=252034>.

Appendix

Statistics for Online Advertising of the Top 100 Ranked Websites

Of the top 100 ranked website:	
percent of total page viewed	47.84%
Websites with ads of the top 100 ranked websites:	56
percent of total page viewed	41.32%
Of those with most revenue from online ads:	26
percent of all page views for the top 100	77.14%

Rank	Top 100 Ranked Properties	Percent of total pages viewed	Supply Ads?	Most Revenue from Ads
1	Fox Interactive Media	8.67%	1	1
2	Yahoo! Sites	6.58%	1	1
3	Google Sites	5.64%	1	1
4	Microsoft Sites	4.14%	1	1
5	AOL LLC	3.61%	1	1
6	FACEBOOK.COM	2.55%	1	1
7	eBay	1.85%	1	1
8	craigslist, inc.	1.50%	0	0
9	Comcast Corporation	0.83%	1	0
10	Viacom Digital	0.54%	1	1
11	Time Warner - Excluding AOL	0.53%	1	1
12	Intuit	0.44%	0	0
13	AT&T, Inc.	0.41%	0	0
14	Amazon Sites	0.36%	1	0
15	EA Online	0.35%	1	0
16	Ask Network	0.31%	1	1
17	Photobucket.com LLC	0.28%	1	1
18	Bank of America	0.28%	0	0
19	BEBO.COM	0.27%	1	1
20	Verizon Communications Corporation	0.26%	0	0
21	Cox Enterprises Inc.	0.25%	1	0
22	Disney Online	0.24%	1	1
23	TaxACT	0.23%	0	0
24	United Online, Inc	0.21%	1	0
25	Glam Media	0.19%	1	1
26	ESPN	0.19%	1	1
27	Wal-Mart	0.18%	1	0
28	Pearson Education	0.17%	0	0
29	Wikipedia Sites	0.16%	0	0
30	GAIAONLINE.COM	0.16%	1	0
31	JPMorgan Chase Property	0.16%	0	0
32	Weather Channel, The	0.15%	1	1
33	Weatherbug Property	0.15%	1	1
34	Gorilla Nation	0.14%	1	1
35	Gannett Sites	0.13%	1	0
36	Earthlink	0.13%	1	0
37	SINGLESNET.COM	0.13%	1	1
38	Expedia Inc	0.12%	1	0
39	New York Times Digital	0.12%	1	1
40	Target Corporation	0.12%	0	0
41	Apple Inc.	0.12%	0	0
42	Wells Fargo	0.12%	1	0
43	JCPenney Sites	0.12%	0	0
44	Community Connect, Inc.	0.11%	1	0
45	The Generations Network	0.11%	1	0
46	E.W. Scripps	0.11%	0	0
47	People Media Sites	0.11%	1	0
48	CNET Networks	0.10%	1	0
49	WildTangent Network	0.10%	1	0
50	CBS Corporation	0.10%	1	1

Rank	Top 100 Ranked Properties	Percent of total pages viewed	Supply Ads?	Most Revenue from
51	PROJECTPLAYLIST.COM	0.10%	1	0
52	Sprint Nextel Corporation	0.10%	0	0
53	WorldNow - ABC Owned Sites	0.10%	0	0
54	CareerBuilder LLC	0.10%	1	1
55	PLENTYOFFISH.COM	0.10%	1	0
56	ADP.COM	0.10%	0	0
57	MYHOTCOMMENTS.COM	0.10%	1	0
58	Citigroup	0.10%	0	0
59	Match.com Sites	0.09%	1	0
60	H&R Block	0.09%	0	0
61	FRIENDSTER.COM	0.09%	1	1
62	Monster Worldwide	0.09%	1	0
63	HI5.COM	0.08%	1	1
64	Limitedbrands	0.08%	0	0
65	BLACKBOARD.COM	0.08%	0	0
66	NETFLIX.COM	0.08%	0	0
67	DEVIANTART.COM	0.08%	1	0
68	Midasplayer.com Ltd.	0.08%	1	0
69	Capital One	0.08%	0	0
70	TD Bank Financial Group	0.08%	0	0
71	Ford Motor Company	0.08%	0	0
72	Liberty Media Holding Corporation	0.08%	1	0
73	Macy's Inc.	0.08%	0	0
74	FUN Technologies	0.08%	0	0
75	Hearst Corporation	0.08%	0	0
76	Ticketmaster	0.08%	1	0
77	ONEMANGA.COM	0.08%	1	0
78	Wachovia Corp	0.08%	0	0
79	Dell	0.07%	0	0
80	IRS.GOV	0.07%	0	0
81	AmericanGreetings Property	0.07%	1	1
82	HOTFREELAYOUTS.COM	0.07%	1	0
83	Clear Channel Online	0.07%	0	0
84	eHarmony	0.07%	1	0
85	Washington Mutual	0.07%	0	0
86	PBS	0.07%	1	1
87	REALPAGE.COM	0.07%	0	0
88	ATHENAHEALTH.COM	0.07%	0	0
89	Groupe PPR	0.07%	1	0
90	Cablevision	0.07%	0	0
91	Sears Sites	0.07%	0	0
92	Avon Products Inc.	0.07%	0	0
93	UPS Sites	0.07%	0	0
94	Move Network	0.07%	0	0
95	iVillage.com: The Womens Network	0.07%	0	0
96	Best Buy Sites	0.07%	0	0
97	ED.GOV	0.06%	0	0
98	Yellowpages.com Network	0.06%	1	1
99	Staples.com Sites	0.06%	0	0
100	Travelport	0.06%	0	0

Source:comScore Media Metrix February 2008

Each website was reviewed between November 15th and December 5th to determine whether it presented advertising on the home page or immediate branches of the home page.