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The Emergence of Global Search Engines: Trends in History and Competition

*By Manish Agarwal & David K. Round**

The web search market is an example of a two-sided market where internet users account for one side and the advertisers for the other. Given the increased regulatory scrutiny faced by the web search market, this paper uses the two-sided market framework to analyze the market structure and the behavioral trends on both sides of the market in order to assess the state of competition in this market. Section 2 traces the evolution of the web search engines. Section 3 presents the two-sided market framework and examines trends on both sides of the web search market. Section 4 concludes.

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I. Introduction

Competition agencies around the world are increasingly paying attention to the web search market with much of the regulatory scrutiny focused upon the search rankings and advertising practices of the dominant web search engines.

In December 2010, the French competition authority concluded a study examining competition in the online advertising sector in France. It observed that Google held a dominant position in the advertising market linked to search engines and identified possible exclusionary conduct and abuses that would merit further investigation.[1] In November 2010, the European Commission began an antitrust investigation into Google's online search and advertising practices as a result of complaints that Google discriminates against websites that offer competing online services.[2] There are news reports that the U.S. antitrust regulators may open an investigation into Google's dominance of the web search industry, an action that has been endorsed by some commentators.[3] Echoing a similar case, Baidu, the popular Chinese web search engine, is facing a complaint that it manipulated its search results to block or lower the ranking of a Chinese online encyclopedia, Hudong.[4]

A common feature underlying these cases is that the web search engine provider whose conduct is under investigation is alleged to be a dominant player in the relevant market and is suspected of abusing its dominant position to the detriment of its competitors and the competition process.

The web search market is an example of a two-sided market where internet users account for one side and the advertisers for the other.[5] Given the increased regulatory scrutiny faced by the web search market, this paper uses the two-sided market framework to analyze the market structure and the behavioral trends on both sides of the market in order to assess the state of competition in this market. Section 2 traces the evolution of the web search engines. Section 3 presents the two-sided market framework and examines trends on both sides of the web search market. Section 4 concludes.

II. The Evolution of Web Search Engines

The advent of the internet has made a vast amount of information available. From 26 known web sites in 1992, there are now over four million web sites and billions of web pages to browse.[6] This rapid growth has given rise to the challenge of managing information so that users can find what they are looking for. Over the years many new products have been invented to help make the web easier to navigate, and one of the most useful of these products is the search engine.

Search engines are designed to search for information on the web by searching documents for user-specified keywords and returning a list where the keywords are found. Search engines generally consist of three main parts: a crawler pro-

gram that traverses the web and looks for webpages that are either not indexed or have been updated since they were last indexed; an index of sites that have been crawled; and a user interface that employs an algorithm to produce results to search queries.[7] The evolution of web search engines since the 1990s highlights the efforts made to improve web crawling, indexing, and searching in order to make it easier to navigate the web.

In its infancy, the internet was simply a collection of sites that users could access to upload or download files; searching for a specific file meant navigating through each file. In 1990 Archie, one of the first attempts at organizing information on the Internet, was created. It provided a database of archived filenames, which it would try to match with users' queries. However, Archie did not index the content of the files. Another problem was that users had to manually maintain the directory of sites that could be searched, which limited its reach.[8]

FROM 26 KNOWN WEB SITES IN 1992, THERE ARE NOW OVER FOUR MILLION WEB SITES AND BILLIONS OF WEB PAGES TO BROWSE.

The next defining step in web search engines was the introduction of robots, which automated the indexing system. The first search engine based on robot technology appeared in 1993. It was called the World Wide Web Wanderer, and it collected information on websites and automatically added that information to an index. Although this robot technology significantly increased the number of sites that could be accessed through automation of the indexing, relevancy of the search results emerged as the next challenge.[9]

In 1994, spider technology was born. The older robots only indexed the sites and the titles of a page. In contrast, spiders (or crawlers) were software programs that indexed the entire content of a web page and recorded web links. The first crawler-based search engine, WebCrawler, appeared in 1994, which indexed not only the names and locations of websites but also their full text, making it possible to search within the text of web pages for desired information. This greatly improved the relevance of search results.[10]

Lycos, launched in 1994, was the first search engine to use hyperlinks between webpages to determine context and relevance. It displayed the title and ranking of a page, provided snippets of web pages, and added features such as prefix matching and word proximity. Yahoo! made its debut in 1994 as a directory, a list of categorized websites with search capability. Unlike other search engines, Yahoo! did not use spider technology to build automatic listings of websites. Instead, human editors were used to catalog the web. Consequently, its index of websites was quite small. In contrast, AltaVista, which was launched in 1995, was indexing up to ten million web pages a day. It did not rely on a single crawler program, and instead used thousands of crawlers to index the internet. It was the first high-speed search engine, the first to allow natural language queries and multi-lingual search, and it included features such as advanced searching tech-

niques (e.g. searching for phrases using quotes). It soon became a popular web search engine.[11]

By 1997, several other search engines providing different degrees of innovation in web search had emerged. Excite, launched in 1995, used concept-based searching that utilized statistical word relationships, such as synonyms, to improve search results when the exact keyword was not entered. HotBot, released in 1996, made use of cookies to store personal search preferences, which enabled personalized search. Ask Jeeves, launched in 1997, used human editors to match users' search queries and ranked search results based on their popularity.[12]

In 1998, Google (initially called BackRub) was launched.

In 1998, Google (initially called BackRub) was launched. It ranked web pages using citation notation, which monitored how many sites linked to a given web page. The more sites and the more important the sites that linked to a given web page, the higher was the site's ranking in the result list. Due to its unique high speed, combined with a unique relevancy based ranking of search results and a simple, easy-to-use interface, Google quickly became a popular search engine.[13]

Since 2000, several other search engines have appeared based on new search engine concepts and technology. For instance, Teoma, founded in 2000, had a unique link popularity algorithm that analyzed links, in context, to rank a web page's importance within its specific subject. For instance, a web page about "baseball" would rank higher if other web pages about "baseball" linked to it.[14] In 2006 Snap was launched, with a completely transparent business model showing search volumes, revenues, and advertisers. It showed users how many others have searched for similar terms, and it also displayed search results with statistics like the number of user clicks and the average page views. In June 2009, Microsoft launched Bing, a new search service that changed the search landscape by providing a list of related searches directly in the result set.[15]

As the web continues to grow rapidly, the challenge of indexing the ever-growing web and producing relevant results to search queries has become enormous. Some search engines have emerged as all-purpose types and try to index the entire web; for instance, Google, Yahoo!, and Bing. Others have found their niche by narrowing their field to a specific field, language, or geographical region. For instance, Baidu, launched in 2000, is a popular Chinese web search engine and Guruji, launched in 2006, is India's first local search engine.[16] Several job search engines, for example monster.com and job.com, have been established to allow employers to post job requirements as well as to help job seekers to search for suitable jobs.

Search engines seek to differentiate themselves on their comprehensiveness, up-to-datedness of their search index, and the relevance of their search results. Another means of differentiation is by providing features such as advanced

search, search in images, videos, maps, news and books, specialized search services such as Google Scholar for searching scholarly literature, text translation, and by providing additional services such as email.

Since the early days of web search, search engine providers have been active in two separate markets—not only in the search business, but also in the advertising business. In fact, advertisement is the main revenue source of many search engines including players such as Google and Yahoo![17]

Advertising in the search engine context can take different forms. On the one hand, traditional types of advertisements—similar to those found in offline newspapers and magazines—such as display ads, sponsorships, and listings or classified ads have been replicated by search engine providers. On the other hand, search-specific advertising products have emerged. The two most prominent types are paid placement, where an advertisement is linked to a search term, and paid inclusion, where the advertiser pays a fee to the search engine provider in order to get a site included in the search index.[18]

Yahoo! was one of the first companies to monetize on-line search through advertising. It allowed advertisers to place banner ads on the search results page for a fee. But in the late 1990s, the search advertising industry was revolutionized by a purely commercial endeavor called GoTo (renamed Overture).[19]

GoTo solicited advertisements and indexed them by keyword. Users searched for relevant ads by keyword and the results returned were ranked based on how much the advertiser was willing to pay for the keyword. Advertisers bid on keywords, and advertisers only paid when a user clicked on the result.

SINCE THE EARLY DAYS OF WEB SEARCH, SEARCH ENGINE PROVIDERS HAVE BEEN ACTIVE IN TWO SEPARATE MARKETS—NOT ONLY IN THE SEARCH BUSINESS, BUT ALSO IN THE ADVERTISING BUSINESS.

This system introduced two new features to web advertising. First, the auction-based system allowed advertisers themselves to set a price on the keywords they valued. Second, advertisers only paid GoTo when a user clicked on the link associated with their ad. Before GoTo introduced the pay-per-click model, advertisers paid on cost-per-thousand-impressions model ("CPM") by paying a set price for every thousand users who saw the ad. GoTo's auctioned, pay-per-click method changed the way advertisers paid for online advertisements. Instead of paying for every thousand views of an ad that may or may not have been associated with a relevant search, advertisers paid only for actual clicks after a user searched for a specific keyword.[20]

The GoTo advertising model has revolutionized online advertising for search engines. Unlike advertising on television or radio or on other forms of online media, search engines offer advertisers more than a general audience. Because

users of a search engine are actively looking for certain information, search engines are able to sell specific ads to advertisers. The GoTo model made search engines a commercially viable tool. By linking the search query term that the user types in with the advertisements that are displayed, search engines have found a way to help advertisers target precisely who they are looking for. This trend has given rise to two forms of search results: organic search results, which are generated through a search engine's own information sorting process; and paid search results, which are advertisements. These different forms of search results highlight the two-sided nature of a web search engine.

III. State of Competition

Web search is an example of a two-sided platform that enables two distinct but related groups of searchers and advertisers to obtain value that would not occur otherwise.[21]

A key feature of two-sided platforms is the presence of "indirect network effects." As described by Evans, indirect network effects exist when the value that a customer on one side realizes from the platform increases with the number of customers on the other side.[22] A search platform is more valuable to advertisers if it has a large number of users. It is more valuable to users looking to buy something if there are more advertisers attracted to the platform because that makes it more likely that the user will see a relevant advertisement. Furthermore, advertising revenue enables a search platform to provide complementary products and services to users, such as email or photo sharing, which increases the value of the search engine for users.

One of the reasons for this asymmetric pricing structure is that searchers give the search platform its value and create positive network effects.

A related feature of two-sided platforms is the need to "balance" the demands of the two sides. In setting prices, for example, a two-sided platform needs to consider that charging a higher price to side A will result in fewer A's using the platform which, in turn, will result in fewer B's getting value from the platform. Thus, as Evans observed, for profit maximization any provider of a two-sided platform has to consider the demands of both sides, the interrelationships between these demands, and the costs of running the platform.[23] Furthermore, one side of a two-sided platform usually gets a better deal. For example, searchers do not pay search engines, but advertisers do. One of the reasons for this asymmetric pricing structure is that searchers give the search platform its value and create positive network effects.[24]

Two-sided platform markets present unique practical challenges for antitrust analysis and enforcement. In a traditional market, the analysis centers on the

responses of a single set of customers to changes in, for example, price or output supplied and the responses of the suppliers to changes in demand. However, in a two-sided platform, market definition and market power analyses must take into account the possibility that the two sides of a platform are interdependent. Therefore, to assess the state of competition in web search engines, we consider both sides of the web search platform. Furthermore, web search engines are an example of a continuously evolving innovative market. Therefore, it would be useful to examine the state of competition in web search engines by examining the market structure and behavior of players over time. As Fisher observed, in antitrust analysis what matters are the constraints other firms and products put on the power of those whose actions are being examined.[25] Therefore, in our assessment we also consider the effect of the other web-based platforms, such as social networking sites on web search providers.

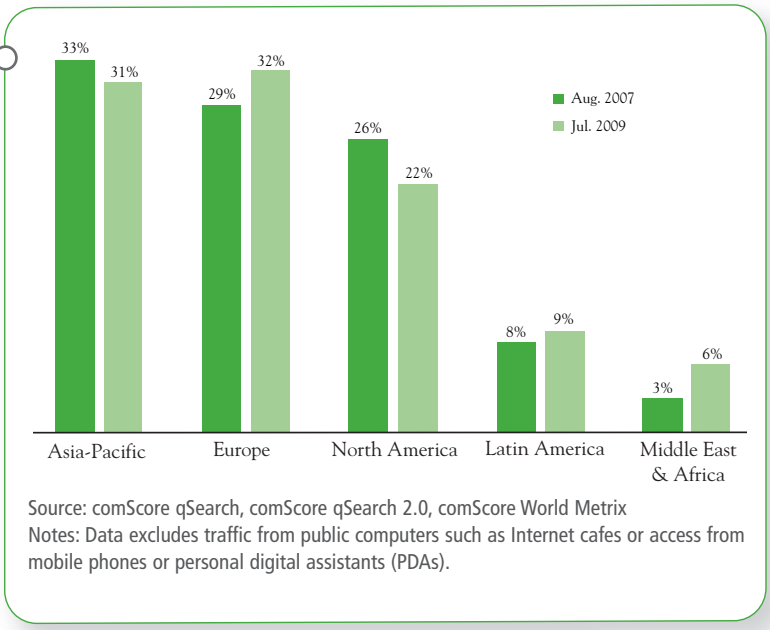
A. WORLDWIDE SEARCH MARKET

As per data published by comScore, more than eight hundred million people aged 15 years and over conducted worldwide web searches in January 2008, and the total number of worldwide searches was over one hundred billion in July 2009.[26]

Figure 1 illustrates the pattern of search behavior across different parts of the world from August 2007 to July 2009. Among the five global regions, Europe accounted for the highest share of searches at 32 percent in July 2009, followed by Asia Pacific (31 percent) and North America (22 percent).

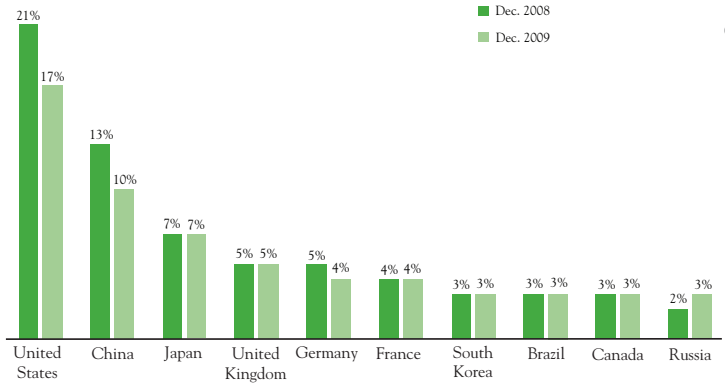
Figure 1

Worldwide Search by Region (share of searches)



Source: comScore qSearch, comScore qSearch 2.0, comScore World Metrix
Notes: Data excludes traffic from public computers such as Internet cafes or access from mobile phones or personal digital assistants (PDAs).

Figure 2 presents search behavior at the country level and shows that the United States remains the largest individual search market in the world with 22.7 billion searches, or approximately 17 percent of searches conducted globally in December 2009. China ranked second with 13.3 billion searches (ten percent share of worldwide search), followed by Japan with 9.2 billion (seven percent) and the United Kingdom with 6.2 billion (five percent). Germany, France, South Korea, Brazil, Canada, and Russia are the other top countries.



Source: comScore qSearch
Notes: Searches based on "expanded search" definition, which includes searches at the top properties where search activity is observed by all search engines, not only the core engines.

Figure 2

Top Ten Countries by Share of Searches

B. SEARCH SHARE BY SEARCH ENGINES

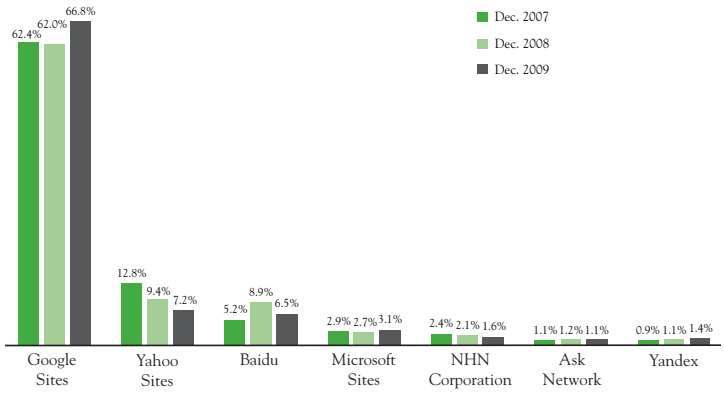
Figures 3 presents the data on top search engines by their share of searches worldwide. Google Sites ranked as the top search property worldwide with 87.8 billion searches in December 2009, or 66.8 percent of the global search market. Yahoo! Sites ranked second with 9.4 billion searches (7.2 percent of the searches worldwide), followed by the Chinese search engine Baidu with 8.5 billion searches (6.5 percent share). Microsoft Sites ranked fourth with four billion searches worldwide (3.1 percent), which increased from 2.4 billion searches in December 2008. The increase has primarily been attributed to the introduction of its new search engine, Bing, in June 2009. NHN Corporation, which owns Naver, the popular search engine in South Korea, ranked fifth with two billion searches (1.6 per cent). Yandex's (the Russian search engine) share of global searches consistently increased during the three time periods, accounting for 1.9 billion searches worldwide in December 2009.

The data highlight that at the global level Google dwarfs the other search engines in searches. For the three time periods for which data are available,

Google's share in global searches increased while that of Yahoo!, the second ranked search engine, showed an opposite trend. The data also show the importance of country-level search engines, Baidu, NHN, and Yandex, suggesting that it is useful to discuss the search share at a country level.

Figure 3

Top Search Properties Worldwide by Share of Searches



Source: comScore qSearch, comScore qSearch 2.0
Notes: Excludes traffic from public computers such as Internet cafes or access from mobile phones or PDAs.

Table 1 reports search share data of leading search engines in the major countries in the four regions of Asia Pacific, Europe, North America, and Latin America for two different time periods, as well as the current top-ranked search engine.

The data show that Google is a dominant player in the North American region with approximately a seventy and eighty percent of search share respectively in the United States and Canada. It also occupies a dominant position in search queries in Brazil.

In Europe, Google is the leading search provider in the United Kingdom, Germany, and France with a search share of eighty to ninety percent in 2009/2010, which represents an increase in all the three countries as compared to the data recorded in 2007. Nevertheless, in Russia, Yandex is the leading search engine with a search share of 64 percent; this share has also increased from 2007.

Yandex's share of the Russian search market of 64 percent in December 2010 was far greater than Google's share of 22 percent.[27] There are several reasons for Yandex being the lead search engine in Russia. The focus on the Russian language helped Yandex occupy the lead position in the initial years as Google

struggled to adapt to the Russian language. However, Google has addressed this gap and has engineers based in Russia who fully understand the challenges of the Russian language. The key factors behind Yandex's continued popularity appear to be its strategy of consistently adding and developing new technologies. For example, in late 2009, Yandex launched its "Matrixnet" machine-learning technology, which has significantly improved its search results by creating algorithms that "learn" as they are used and have increasingly complex ranking factors. Besides focusing on improving the quality of its search results, Yandex has been expanding into other related services. For example, in 2010, it acquired GIS technology to provide map services; it launched a job site in the same year; and it entered in a deal with Facebook.

Table 1

Leading Search Engines by Region and Country

Region/country	By share of searches 2007@		By share of searches 2009/2010		By rank[a] 2011^
Asia Pacific					
China	Baidu	54%	Baidu#	63%	Baidu
Japan	Yahoo!	49%	Google#	48%	Yahoo! Japan
South Korea	NHN (Naver)	65%	NHN (Naver)$	63%	NHN (Naver)
India	Google	81%	Google#	89%	Google
Europe					
U.K.	Google	74%	Google$	91%	Google
Germany	Google	80%	Google§	80%	Google
France	Google	82%	Google¥	90%	Google
Russia	Yandex	52%	Yandex&	64%	Yandex
North America					
U.S.	Google	64%	Google¤	72%	Google
Canada	Google	78%	Google#	80%	Google
Latin America					
Brazil	Google	90%	Google£	90%	Google

Source: comScore qSearch; comScore qSearch 2.0; comScore World Metrix; alexa.com (viewed 17 April 2011); LiveInternet (Russia); Hitwise (UK); Webhits (Germany); At Internet Institute (France); Koreanclick (South Korea); Evans (2008)[28].

Notes: Data excludes visits from public computers such as Internet cafes or access from mobile phones or PDAs.

[a]The sites in the top sites lists are ordered by their one month alexa traffic rank. The one month rank is calculated using a combination of average daily visitors and page views over the preceding month. The site with the highest combination of visitors and page views is ranked number one.

@Data are for December 2007; #Data are for September 2009; ^Data are for April 2011; $Data are for May 2010; $Data are for May 2008; §Data are for June 2009; ¥Data are for April 2009; &Data are for December 2010; ¤Data are for August 2010; £Data are for July 2009.

In the Asia Pacific region, Google is the leading search engine in India with a search share of 89 percent as of September 2009. In Japan, Google took over from Yahoo! as the leading search engine in September 2009 only to be replaced

by Yahoo! Japan in April 2011. In the other two major Asian markets, China and South Korea, a domestic player has occupied the top spot in web searches.

Baidu is the most popular search engine in China with a 63 percent share of Chinese search. There are several reasons, commercial and regulatory, which contribute to Baidu's leading position. These include the censorship problems faced by Google in 2009, which until then had a 22 percent share of Chinese searches. Since then, Google's share dwindled to 11 percent in the fourth quarter of 2010, while Baidu's share increased to 84 percent. Baidu also occupies an edge over Google in returning precise search results of China domestic matters.[29]

In South Korea, NHN Corporation owns Naver, the leading search engine. Its share of searches is over sixty percent; it is followed by Daum which has a share of 21 percent and Nate at third place with a share of nine percent.[30] Naver had been the dominant player in the South Korean search market for about a decade, but the market structure was different in the 1990s and in the early 2000s. Yahoo Korea, launched in 1997, occupied a dominant position until Daum was launched, enjoying a rapid growth on the basis of its Hanmail service which, by the beginning of 2000s, became the most popular search engine. However, this did not last long. Naver, launched in 1999, introduced Knowledge iN, a knowledge search service, together with integrated search and in 2001 it became one of the three leading search engines along with Daum and Yahoo by search query volume. After 2003, Naver has been the most popular search engine.[31] It is claimed that Naver's strength lies in its ability to understand the search culture of domestic users, which is reflected in its search results.[32]

It appears that the presence of Google and Yahoo! as global players performing in a country puts competitive pressure on that country's domestic search engines to perform.

While Google is the leader in global searches, the market structures at individual country levels are quite different. In several countries, Google is the leading search provider, but in other countries domestic players occupy the top spot. It appears that the presence of Google and Yahoo! as global players performing in a country puts competitive pressure on that country's domestic search engines to perform. The leading domestic search engines have been responding to this competitive threat by making consistent efforts to develop new technologies, which is helping them maintain their lead. The rise of Google as the preferred global search engine can also be attributed to similar factors, which is demonstrated by the story of its ascendency in the U.S. search engine market.

Figure 4 reports the shares of U.S. search traffic for the top five U.S. web search engines: Google, Yahoo!, MSN/Microsoft/Bing, Time Warner/AOL, and Ask. For the U.S. search market, in December 2004 Google and Yahoo! occupied comparable market shares of approximately 35 percent. Since then, however, Google has managed to increase its share to 64 percent while Yahoo! has seen

its market share plummet to 19 percent. However, Yahoo!'s search share has increased between 2009 and 2010, as has Microsoft's share since the launch of Bing in June 2009. Although Google's search share has declined between 2009 and 2010, it remains the leading search provider in the United States by a substantial margin.

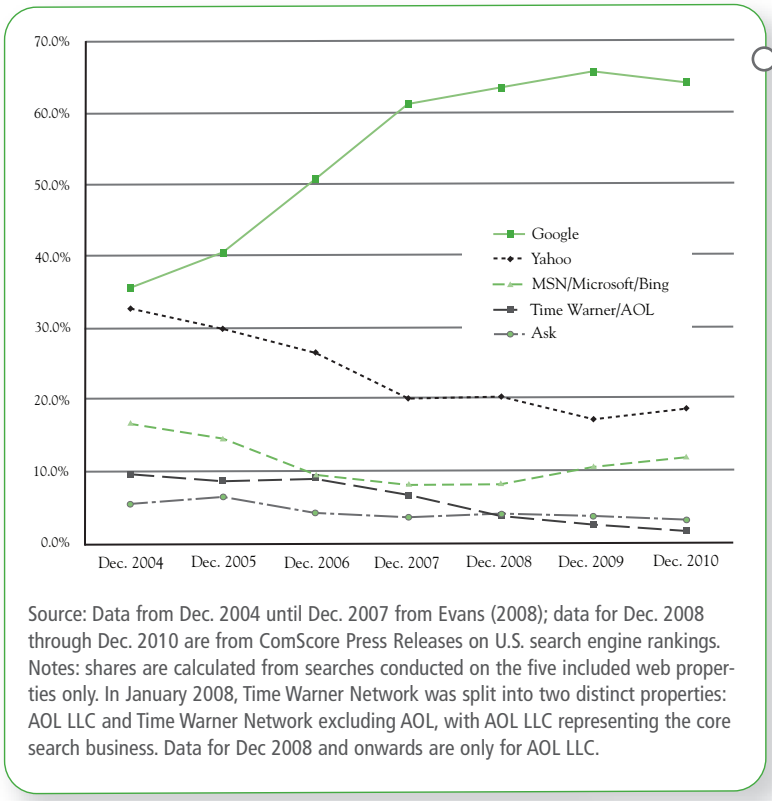


Figure 4

U.S. Search Engine Share by Searches

Source: Data from Dec. 2004 until Dec. 2007 from Evans (2008); data for Dec. 2008 through Dec. 2010 are from ComScore Press Releases on U.S. search engine rankings. Notes: shares are calculated from searches conducted on the five included web properties only. In January 2008, Time Warner Network was split into two distinct properties: AOL LLC and Time Warner Network excluding AOL, with AOL LLC representing the core search business. Data for Dec 2008 and onwards are only for AOL LLC.

Table 2 reports the top three search providers in the United States from 1999 to 2007. It also indicates whether the firm used its own search engine technology or whether the technology was outsourced. Yahoo! held the top spot from 1999 to 2002; Google achieved a higher share than Yahoo! of search traffic in 2003 and has held the lead ever since. The table highlights that, Google, Yahoo! and MSN/Bing, the three global search engines, have emerged strongly from the churning in the web search market. By 2007, the search share of others such as AltaVista, Lycos, Ask Jeeves (now Ask), and Excite is miniscule.[33]

Google's rise as a leading search provider demonstrates how a search engine can outperform its competitors based on superior innovation.[34] Its search algo-

Table 2

Leaders in Search in the United States by Search Traffic

Rank	1999	2000	2001	2002	2003	2004	2005	2006	2007
1st	Yahoo! (Inktomi)	Yahoo! (Google)	Yahoo! (Google)	Yahoo! (Google)	Google (Own)	Google (Own)	Google (Own)	Google (Own)	Google (Own)
2nd	AltaVista (Own)	AltaVista (Own)	Microsoft (Inktomi)	Google (Own)	Yahoo! (Google)	Yahoo! (Own)	Yahoo! (Own)	Yahoo! (Own)	Yahoo! (Own)
3rd	Excite (Own)	Lycos (Fast Search & Transfer)	Google (Own)	Microsoft (Inktomi)	Microsoft (Inktomi)	Microsoft (Inktomi)	Microsoft (Own)	Microsoft (Own)	Microsoft (Own)

Source: Evans (2008)

Notes: Search technology powering search website given in parentheses; Yahoo acquired Inktomi in 2003.

rithm, which first incorporated web site popularity by taking into account the number of links pointing to a site, brought a significant increase in the quality of search results. This algorithm, called PageRank, is closely related to academic citation counting. It is based on the concept that the quality of an academic article depends on the number of other articles that cite it, and the quality of those citations depends on the number of citations generated by the citing articles. In web search, every link to a particular web site can be considered as being like an academic citation.[35] Thus, PageRank allowed Google to develop a way to index and search the internet that relied on a web page's "reputation" with other pages rather than just on a page's self-promotion. Its better organic search results drove users to it quickly in less than two years after it was launched, and it has maintained its lead by continuously striving to improve the quality of its search results. The recent gains in the search share of Yahoo! and Microsoft are due, in part, to the introduction of contextual search that tie content and related search results together. The various initiatives taken by the leading search providers are discussed in Section III(E).

C. TRENDS IN ONLINE ADVERTISING

Online advertising revenue has increased steadily over time, both in absolute terms and as a fraction of all advertising revenue. Evans (2008) reports that the share of U.S. online advertising expenditure to all advertising expenditure increased from 3.2 percent in 2000 to 8.8 percent in 2007. This trend has continued unabated as online ad spending in the United States at US $25.8 billion in 2010 was estimated to surpass newspaper advertising, making it second only to TV advertising.[36] Furthermore, the online advertising market has proved resistant to the effects of the recession caused by the recent global financial crisis. Unlike spending on all other major media, worldwide online advertising spending increased from US $54.2 billion in 2008 to US $55.2 billion in 2009 and to US $61.8 billion in 2010.[37]

The relative mix of online advertising has also changed. Figure 5 shows the evolution of various online advertising formats from 2000 through 2010. In 2000, display advertising, which is similar to newspaper and magazine ads, accounted for 78 percent of total online ad spending, while search ads, which are linked to a search for a keyword, accounted for only one percent. Ten years later, in 2010, search ads accounted for the largest share of online ad revenue at 46 percent followed by display ads, which accounted for 38 percent. In the past decade, search-based advertising was the fastest-growing segment of online advertisement till 2004, and thereafter its growth has plateaued. This is mirrored by a decline in the share of display ads till 2006. Nevertheless, Figure 5 shows that since 2008 the share of display ads has consistently increased and the share of search ads has changed little. Together the two formats accounted for 84 percent of total U.S. online ad spending in 2010.

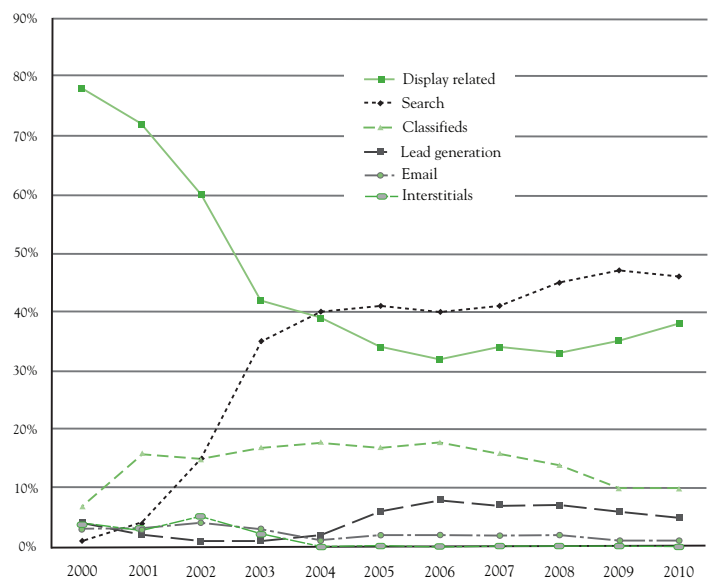


Figure 5

Share of U.S. Online Advertising Revenues by Different Formats

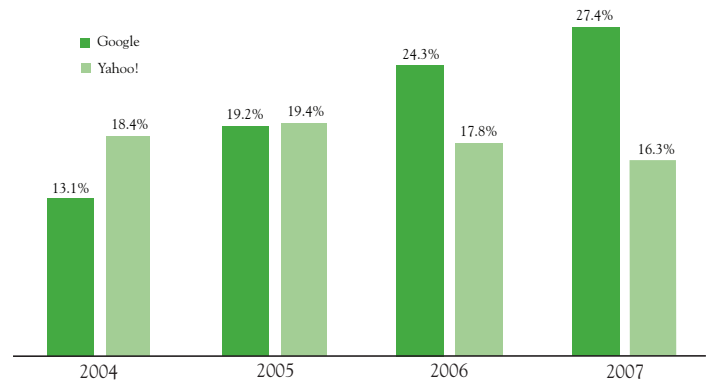
Source: Interactive Advertising Bureau press releases 2009-10; Evans (2008)
Notes: Display advertising refers to fees advertiser pays an internet company for space to display a static or hyper-linked banner or logo on one or more of the internet company's pages. Sponsorships represent custom content and/or experiences created for an advertiser that may or may not include ad elements such as display advertising, brand logos, advertorial, or pre-roll video. Email ads include banner ads, links, or advertiser sponsorships that appear in commercial e-mail communication. Interstitials are ads displayed during a transition from one web page to the next. Search refers to fees advertisers pay internet companies to list and/or link their company site domain name to a specific search word or phrase, and it includes paid search revenues. Classifieds refer to fees advertisers pay internet companies to list specific products or services (e.g., online job boards and employment listings, real estate listings, automotive listings, auction-based listings, yellow pages). Lead Generation refers to fees advertisers pay to internet advertising companies that refer qualified purchase inquiries (e.g., auto dealers that pay a fee in exchange for receiving a qualified purchase inquiry online).

D. SHARE OF SEARCH ENGINES IN ONLINE ADVERTISING

Figure 6 reports the U.S. online ad revenue shares of Google and Yahoo! from 2004 to 2007. Their combined share increased from 31.5 percent in 2004 to 43.7 percent in 2007. While Google's share increased steadily from 13.1 percent in 2004 to 27.4 percent in 2007, Yahoo!'s share declined to 16.3 percent in 2007 from a peak of 19.4 percent in 2005.

Figure 6

U.S. Online Ad Revenues at Google and Yahoo! (per cent of total U.S. online ad expenditure)



Source: http://www.emarketer.com/Article.aspx?R=1005162 (viewed 17 April 2011).

The data reported in Figure 6 are for the total online ad revenues. As discussed in Section III(C), display ads and search-based advertising are the two leading formats in online advertisement, and it will be useful to examine the ad revenue share of the search engines in these two formats. Data are, however, only available for display ads and Figure 7 reports the share of top U.S. internet publishers based on the number of display ad impressions delivered. Nearly half (48.8 percent) of all display ads seen by U.S. internet users originate on these properties.

In November 2007, Yahoo! sites ranked as the top display ad publisher property with 18.8 percent of display ad views, but by the third quarter of 2010, the popular social networking site Facebook led all online publishers with a share of 23.1 percent of online display ads, up from 1.5 per cent in November 2007. Yahoo! sites ranked second with a share of 11 percent, followed by Microsoft sites with 5 percent. Google's share of online display ads was 2.7 percent in the third quarter of 2010.

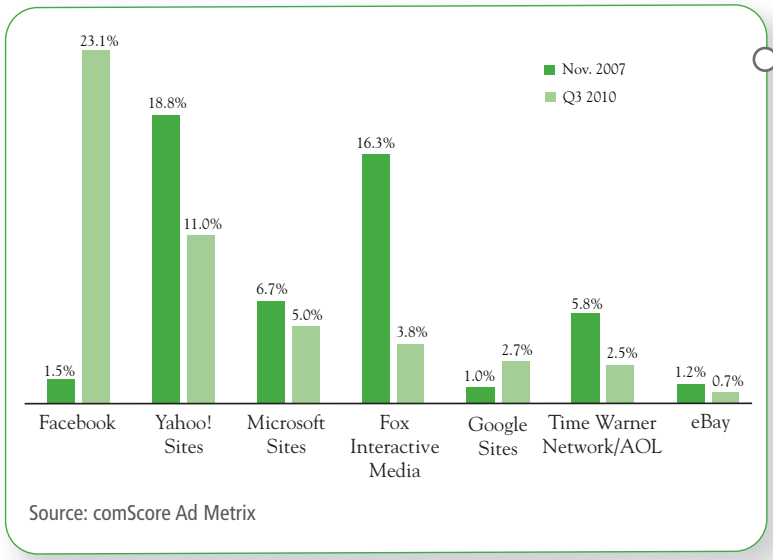


Figure 7

Top U.S. Online Display Ad Publishers by Share of Online Display Ads

Although the unit of measurement for data reported in Figures 6 and 7 are different—total online ad is reported as a revenue figure and the display ad format is reported as a number—Google's relatively high share in total U.S. online ads and relatively small share in the display ad format seems to suggest that majority of its online advertisements are search-based. For advertisers, the greatest value comes from buying advertising on the search engine with the most users and the best results; that is, higher click-through rates. In both parameters Google stands out as a better platform. Google's success with organic search and its dominance of the search market appears to have contributed to its success in getting a significant share of the search-based advertising market. The numbers thus seem to suggest Google's linked dominance of both search and search-based online advertising.

However, Google's dominance in online advertising appears to be under threat, and the most likely source for competition lies in the increasing popularity of social networking sites such as Facebook. It can be argued that since Google is already a small player in online display ads, the emergence of internet properties such as Facebook—a leading player in display ads—should not affect its bottom line. Nevertheless, as argued by Spulber,[38] advertisers allocate their expenditures on the basis of expected returns and web search providers compete with each other and with other types of media to attract advertisers. Besides social network websites, search providers are likely to face competition from other forms of emerging platforms, for example, tablets. Additionally, Goldfarb & Tucker[39] present empirical evidence of substitution between online and offline advertising. Thus, there appear to be indications of competitive threats on the advertising side of the web search engine market.

E. STRUCTURAL AND BEHAVIORAL RESPONSES

Search providers have adopted various strategies such as mergers and acquisitions ("M&A") and the introduction of new technologies to improve their market share in search as well as online advertising. Table 3 provides a list of search providers ranked by their total M&A activity from 2000 to 2008. Yahoo!, Google, and SoftBank Corporation (which has a majority stake in Yahoo Japan) have been active in M&A.

Table 3

Mergers and Acquisitions by Search Providers (2000-2008)

Acquirer (including subsidiaries involved as acquirers)	Total number of mergers	Value of mergers (USD million)
Yahoo! Sites	53	6382.1
Google Sites	46	6477.0
SoftBank Corp (Yahoo Japan)	37	591.3
Overture Services Inc (Goto)	5	394.8
Microsoft/MSN	2	13.3

Source: Thomson Reuters' SDC Platinum

Approximately 76 percent of the acquisitions (by number) by the search providers were of target companies that provided internet-related services such as web search, online mapping technology and online document conversion. These acquisitions have helped the search providers expand their product line. For example, many of Google's well-known services are a result of acquisitions. This includes Google Docs (acquisition of Writely), Google Maps (acquisition of Keyhole), and Google's foray into mobile communications (acquisition of Android). Each of Google's acquisitions can be seen as a strategy to strengthen its market share either by attracting more advertisers, or by attracting more users to the search engine. Google's acquisition of DoubleClick is an example of an acquisition designed to expand its presence in the display advertisement market.

For several years Yahoo! outsourced its search service to other providers, considering it secondary to its directory and other content features, but by the end of 2002 it realized the importance and value of search and started aggressively acquiring search companies. Yahoo! acquired Inktomi in December, 2002, and Overture in July, 2003 (which had acquired AltaVista in 2003), and combined the technologies from these various search companies to make a new search engine. Consequently, as shown in Table 2, Yahoo! began using its own search technology in 2004.

Search providers have been focusing on introducing new features to their core business of search. For example, in June 2009 Microsoft launched Bing, a new search service that changed the search landscape by placing inline search suggestions for related searches directly in the result set. Yahoo! launched contextual search in 2005, which analyzes the page being read and gives a list of related search results. Therefore, instead of starting a search from a text box, a person would search while reading a specific page. Google launched an instant search interface in 2010 that suggests and displays search results while users type. Bing added Instant Answer to its image search results in 2010, which is a suggestion tool to help the users decide which definition of a query they want to see. Yahoo! introduced Search Direct in 2011 which is designed to provide users current relevant content, along with improved suggestions, and to display answers instantly to users as they type the search query in the search box.

IV. Conclusion

Web search is an example of a two-sided platform. In order to examine the state of competition in this market, it is important to consider the interdependence between its two sides, searchers and advertisers, and to identify the competitive constraints on both sides. It is also important to give due regard to the dynamic nature of competition in web search engines.

This paper shows that Google is the leading search provider globally and in many countries. There are, however, differences in market structures across countries. Furthermore, given the dynamic nature of the web search engine market, it is clear that a player's dominance depends on its innovation activity relative to others. Not surprisingly, search providers appear to be striving continuously to introduce new technologies to improve the quality of their search results. Online advertisements are the main revenue source for many search engines. With the advent of other forms of platforms that are likely to compete for online advertisements, it will be useful to examine their effects on search providers' strategies with respect to advertisements as well as search.

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