THE EVOLUTION OF PRODUCT SEARCH

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This paper examines the evolution of product search. We provide an overview of product search in the pre-internet era and discuss how online search evolved from directory-based search in the early 1990s to "vertical" search engines by the late 1990s. We also document the prominence of price comparison sites in the mid-2000s and the challenges these platforms faced through 2010. We then use comScore qSearch data to closely examine trends in product search between 2010 and 2012. We find that today, the vast majority of shoppers conduct product searches at retailer sites and other marketplaces, whereas traditional price comparison sites have become less important.

INTRODUCTION

Product information—the prices, attributes, and availability of products sold by different sellers—is important for the functioning of competitive markets. Product information may be transmitted to consumers through the marketing efforts of firms; it may be acquired directly by consumers who spend time and other resources searching for a product, or both. Since the gathering and dissemination of information through marketing and search is costly, rational economic actors typically stop short of gathering—or providing—full information about products.[1]

During the course of human history, numerous innovations have dramatically reduced market participants' costs of acquiring and transmitting product information.[2] This paper discusses some of these innovations, including the evolution of product search on the internet. Consumers have

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[1] *See* George J. Stigler, *The Economics of Information*, 69 J. POL. ECON. 213, 222 (1961). This article is regarded as the seminal work in this line of research.

[2] For example, innovations in transportation—buggies, automobiles, roads, and highways—and modes of communication—newspapers, billboards, the telephone, radio, television, and the internet—made it easier for consumers to search for products and for sellers to transmit product information to consumers.

clearly benefited from their ability to more easily search for products online. Thanks to innovations that have reduced consumers' costs of locating products online and to the heightened competition brought on by these innovations, consumers have enjoyed quantifiable increases in welfare because of lower prices[3] and greater product variety.[4]

Our paper is organized as follows: Section I discusses product search in the pre-internet era, including some of the economics literature developed in that era that shaped our understanding of the role that search costs play in the formation of market prices. Section II examines the early beginnings of online product search during the 1990s, which began with directories and catalogues of sites, such as Yahoo!, and web search engines, such as Lycos and Excite, and quickly evolved into "vertical" search engines, such as Dealtime and mySimon, which searched subsets of the growing number of webpages. Section III examines product search between 2000 and 2010—a period in which product search platforms evolved to overcome significant problems with the technologies that were used in the 1990s to fetch product information for consumers.

Section IV uses comScore's qSearch data to examine trends in product search between 2010 and 2012. Consistent with the earlier evolution, the data reveal that traditional price comparison sites, which include players like PriceGrabber, Shopping.com, Dealtime, Shopper.com, Google Product Search, and Bing Shopping, are becoming less important. Indeed, product searches at traditional retailers such as Walmart, online retailers such as Amazon, and other online marketplaces such as eBay dwarf those at comparison sites. Furthermore, the share of product searches performed at price comparison sites relative to other vertical sites has declined since 2010. The most recent data suggest that product search has evolved to the point where the vast majority of consumers conduct product searches at retailer and marketplace sites, such as Walmart, Amazon, and eBay.

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[3] *See* Michael R. Baye, John Morgan & Patrick Scholten, *The Value of Information in an Online Consumer Electronics Market,* 22 J. PUB. POL'Y & MARKETING 17, 18 (2003); Jeffrey R. Brown & Austan Goolsbee, *Does the Internet Make Markets More Competitive? Evidence from the Life Insurance Industry*, 110 J. POL. ECON. 481, 487-88 (2002) (analyzing the prices of term life policies and how they respond over time as their buyers begin using the Internet); *see also* NASH-EQUILLIBRIUM.COM, http://www.nash-equilibrium.com/Data.php?measure1=Value _of_Information&measure2=&limit=99999 (last visited Oct. 23, 2012) (documenting that consumers using price comparison sites to purchase at the lowest price rather than average price saved about 16%, a trend that stayed consistent throughout the 2000s).

[4] See Erik Brynjolfsson, Yu (Jeffrey) Hu & Michael D. Smith, *Consumer Surplus in the Digital Economy: Estimating the Value of Increased Product Variety at Online Booksellers*, 49 MGMT. SCI. 1580 (2003) (showing that the increase in the product variety in books—owing to the ease with which online shoppers can locate books—increased consumer welfare by about $1 billion in 2000). This may not seem like a staggering number, but considering the U.S. Census Bureau reported that online retail sales of *all* goods and services in 2000 totaled only $27 billion, $1 billion in additional consumer surplus within the book segment alone is substantial.

The apparent decline in the relative importance of traditional price comparison sites is even more pronounced when one includes searches on platforms such as Craigslist, which is branded currently as a marketplace for used products, jobs, and other services. In light of Craigslist's number of users, it is potentially well-positioned to expand its listings to include both new and used products, as both Amazon and eBay have done in recent years. Amazon initially sold books from its own inventory. Today, it sells general merchandise not only from its own inventory, but new and used products for Amazon Marketplace sellers as well. Likewise, eBay began as an auction site that brought buyers and sellers of used products together. By the beginning of 2012, 70% of eBay's listings were for new products, and over 60% of its listings charged a fixed price rather than using an auction.[5]

Finally, the Concluding Remarks discuss several challenges in accurately measuring online product search. Among these challenges is the fact that a growing number of "searches" on traditional retailers' sites are not included in traditional data because they are "menu"- or "icon"-driven actions rather than textual searches. Additionally, the comScore qSearch data does not account for searches on the growing number of "closed" systems—devices using Amazon's Price Check App, Apple's iTunes Store, or the Best Buy App, for instance. For these reasons, measures of product search based on browser behavior may understate the importance of product search on retailer sites and online marketplaces.

I.   PRODUCT SEARCH BEFORE THE INTERNET

At the dawn of civilization—long before the internet, cars, phones, and before the emergence of money as a medium of exchange—a hunter wishing to acquire grain in exchange for game had to search for someone wishing to exchange grain for meat. The hunter's costs of locating the right trading partner—search costs in this barter economy—included the calories lost carrying meat from camp-to-camp in an attempt to identify a potential trading partner. As Jevons noted over a century ago, "There may be many people wanting, and many possessing those things wanted; but to allow of an act of barter, there must be a double coincidence, which will rarely happen."[6] In the history of humankind, the very first innovation that substan-

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[5] *See* Alice Hines, *eBay's 'Buy It New' Rebranding Angers Devoted Used Goods Sellers*, DAILY FINANCE (Nov. 11, 2011), http://www.dailyfinance.com/2011/11/02/ebays-buy-it-new-rebranding-angers-devoted-used-goods-sellers/.

[6] WILLIAM STANLEY JEVONS, MONEY AND THE MECHANISM OF EXCHANGE 3 (2d ed. 1876).

tially reduced the cost of product search was the invention of money as a medium of exchange.[7]

Even after the emergence of money as a medium of exchange, product search was still very costly by today's standards. Over time, advances in transportation technologies, such as buggies and automobiles, and communication technologies, such as newspapers, telephones, and the yellow pages, reduced consumers' costs of seeking different sellers to compare prices and other product attributes.

The economics literature on product search predates the internet; it began in 1961 when Nobel Laureate George Stigler quipped that "[information] occupies a slum dwelling in the town of economics."[8] Since then, thousands of theoretical and empirical papers relating to the economics of information have been published.[9] One of the central themes of this literature is that consumer search costs give retailers market power—sometimes even monopoly power. A second theme is that reductions in search costs induce consumers to search more intensely for better deals. To the extent that reductions in search costs heighten competition among retailers, this reduces retailers' market power and increases consumer welfare.

II. THE BEGINNINGS OF ONLINE PRODUCT SEARCH

With the exception of the invention of money as a medium of exchange, the internet arguably has reduced product search costs more than any other innovation in the history of humankind. Today, the internet permits buyers to quickly and easily locate the best deals and expands competition to sellers that may be located far from a given consumer's domicile.[10] But this was not the case at the dawn of the internet. In June 1993, there were only about 130 "dot-com" websites. By the end of 1996 there were about 650,000,[11] and by the end of the decade, the internet contained mil-

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[7] *See generally* Karl Brunner & Allan H. Meltzer, *The Uses of Money: Money in the Theory of an Exchange Economy*, 61 AM. ECON. REV. 784 (1971) (analyzing the individual and social choice of the assets used as money, the services money provides, the relation of these services to the choice of a monetary unit, and some implications); Nobuhiro Kiyotaki & Randall Wright, *A Search-Theoretic Approach to Monetary Economics*, 83 AM. ECON. REV. 63 (1993) (applying a search-theoretic equilibrium model to formalize the essential function of money as a medium of exchange).

[8] Stigler, *supra* note 1, at 213.

[9] *See generally* Michael R. Baye, John Morgan & Patrick Scholten, *Information, Search, and Price Dispersion*, *in* HANDBOOK IN ECONOMICS AND INFORMATION SYSTEMS 323 (T. Hendershott ed., 2006) (surveying the empirical literature on information, search, and price dispersion).

[10] Michael R. Baye & John Morgan, *Information Gatekeepers on the Internet and the Competitiveness of Homogeneous Product Markets*, 91 AM. ECON. REV. 454, 454 (2001).

[11] Clifford Lynch, *Searching the Internet*, SCIENTIFIC AMERICAN, Mar. 1997, at 52, 53.

lions of sites.[12] The growing number of websites—coupled with growth in the number of pages at each site—made it difficult for users to locate product and other information about potential sellers. To make matters even worse, the rapid growth of content on the internet was exceeding content organizers' abilities to categorize it.

Most websites developed in the early- to mid-1990s were built around the page model, which led content organizers to build content directories. For example, Yahoo! and LookSmart developed algorithms that crawled the web, grouped pages around similar content, and displayed directories of pages that attempted to organize content into hierarchical categories.[13] A shopper wishing to locate a computer game, for example, had to commit to a particular category, such as "Computers and the Internet," "Entertainment," or "Recreation and Sports," and navigate down that category. This made it costly for users to switch to a different top-level category or change search strategies midstream. Essentially, the directory format required users to employ a sequential search strategy—that is, sequentially clicking on categories and making a decision to "continue" or "stop" this particular search strategy after each new page in the hierarchy was reached.[14]

Web search engines, such as Excite, Webcrawler, Lycos, and AltaVista, were in their infancy during the mid- to late-1990s and were not particularly adept at performing product searches. "Even the best algorithms for ranking texts in order of relevance [were] unreliable when queries contain[ed] just a handful of search terms."[15] This unreliability—combined with (1) the staggering growth in pages that web search engines had to "crawl" and index, and (2) the fact that at this time the internet was little more than a "chaotic repository for the collective output of the world's digital 'printing presses'"[16] rather than a venue for overcoming the "coincidence of wants" problem of potential buyers and sellers—helped fuel "vertical" product search engines. Vertical search engines targeted a smaller number of sites with similar content, such as news, travel, or retailer websites, and thus held the promise of providing consumers with superior search results for specific types of search, including product search.[17] Rowley notes that

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[12] This is measured by the number of servers. *See* Bernardo A. Huberman & Lada A. Adamic, *Evolutionary Dynamics of the World Wide Web* (1999), *available at* http://arxiv.org/abs/cond-mat/9901071v2.

[13] For example, see Marti A. Hearst, *Interfaces for Searching the Web*, SCIENTIFIC AMERICAN, Mar. 1997, at 52, 68-72.

[14] For a survey of the literature on sequential and fixed-sample sized search, see Baye et al., *supra* note 9.

[15] Hearst, *supra* note 13, at 71.

[16] Lynch, *supra* note 11, at 52.

[17] For purposes of this paper, product search excludes search for services such as news, travel, or employment. We note that the online travel booking site, Expedia.com, was launched by a division within Microsoft in 1996, and was spun off from Microsoft three years later. *See Company*, EXPEDIA, INC., http://www.expediainc.com/company.cfm (last visited Dec. 19, 2012).

some web search engines, such as Excite, automatically interpreted some searches, such as "flowers," as a product search and diverted the query to a vertical search engine, like Jango, to return product search results.[18]

The genesis of online product search began with the emergence of price comparison sites. PriceWatch—established in 1995 and still in existence today—brands itself as "The Web's very first price comparison site."[19] Several other price comparison sites were launched in the mid-1990s, including BargainFinder.com, Killerapp.com, and BargainBot. Early price comparison sites were essentially "shopbots," short for shopping robots, that crawled a handful of specific retailer sites on the web to "scrape" or extract product information. This information was then displayed to consumers searching for a particular product on the comparison site. BargainFinder, for instance, was a comparison site specializing in music (at the time, CDs).[20] It searched only eight music retailers' websites and returned product information in the form of prices for titles queried by consumers.

The early price comparison sites faced a number of challenges. Textual queries by consumers searching for product information needed to be matched with data obtained from the webpages of retailers containing product information related to the query, and shopbots were far from perfect in matching consumer intent with metadata extracted from sellers' webpages. Retailers' sites were not structured in a manner that allowed shopbots to accurately identify the specific product a given consumer was searching for. As a result, it was not uncommon for a search on a comparison site to return "no results" or only a single result. Some retailers, fearful of the competitive effects of providing consumers with comparative price information, blocked shopbots from accessing their sites.[21]

First-generation price comparison sites had limited product breadth; they tended to specialize in specific product segments, such as books on BargainBot's website or music on BargainFinder's website. They frequently returned irrelevant results, inaccurate prices, and lists of sellers that did not actually have the item in stock. For example, a product search for "Palm V" at mySimon returned a list of merchants selling this item as well as merchants selling accessories for the Palm V, such as carrying cases, cradles, chargers, and so on.[22] All of these factors made it difficult for con-

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[18] Jennifer Rowley, *Product Search in e-shopping: A Review and Research Propositions*, 17 J. CONSUMER MKTG. 20, 30 (2000).

[19] *See* PRICEWATCH, http://www.pricewatch.com/ (last visited Dec. 19, 2012).

[20] *See* Kristen Lieb, *Bargain Finder Generates Some Heat*, BILLBOARD, May 1996, at 76.

[21] For evidence that this actually happened, see Marti A. Hearst, *Interfaces for Searching the Web*, SCIENTIFIC AMERICAN, Mar. 1997, at 71.

[22] Michael R. Baye, John Morgan & Patrick Scholten, *Price Dispersion in the Small and in the Large: Evidence from an Internet Price Comparison Site*, 52 J. INDUS. ECON. 463, 475 (2004).

sumers to use comparison sites to obtain accurate, apples-to-apples compar-
isons of the prices that different sellers charged for the same product.

The fact that first-generation price comparison sites lacked relation-
ships with sellers led to other problems as well, such as the inclusion of
unscrupulous merchants in search results and outdated product information.
Growth in internet connectivity rapidly expanded the universe of retailers
with websites that needed cataloging, and this made it difficult for shopbots
to provide shoppers with accurate and up-to-date product information. As
Baye, Morgan, and Scholten noted, "there were nearly 10,000 consumer
electronics retail establishments in the United States in 1997. Each of these
stores could, in principle, advertise their prices on price comparison
sites . . ."[23]   Additionally, first-generation price comparison sites focused
almost exclusively on price. Price is certainly an important component of
purchase decisions, but other factors—notably shipping costs, the seller's
reputation, product availability, and product attributes—are also important.

In short, while the "noisy" product search results at comparison sites
were superior to the results obtainable through web search engines, further
innovations were needed to overcome the problems of irrelevant search
results, outdated product and price information, the inclusion of unscrupu-
lous merchants, and so on.

III.   EVOLVING SOLUTIONS: THE FIRST DECADE OF THE MILLENNIA

The growing number of sellers wishing to reach consumers, coupled
with the growing number of pages to scour, created two problems for prod-
uct search platforms. First, different web pages had different formats; the
code a search platform needed to extract information from one retailer's
website might not work at other sites. This exacerbated the problems dis-
cussed above, such as product searches returning irrelevant results. Second,
there was an allocation problem. With tens of thousands of products—and
thousands of firms selling a given product—who gets the scarce real estate
on results pages following product searches? The poor performance of
comparison sites using shopbot technologies, together with this allocation
problem, resulted in the evolution of comparison sites based on "crawls" to
websites. At these sites, sellers "opted in" by inserting their own data and
agreeing to pay listing and/or click-through fees.[24]

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[23]   Baye et al., *supra* note 3, at 17.
[24]   Michael R. Baye, Cathy Gao & John Morgan, *On the Optimality of Clickthrough Fees in
Online Markets*, 121 ECON. J. 340, 341-42 (2011).

### Figure 1. Screenshot from the Price Comparison Site, Shopper.com, Circa 2001

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Buy Info	Compu America More company info	★★★	$549.00	CA	800-533-9005	Starts at $9.95	In Stock	3/24/2001
Buy Info	PCNation.com CNET Certified Store More company info	★★☆	$645.45	IL	800-969-5255	16.00	Y	3/23/2001
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Buy Info	Micro Warehouse CNET Certified Store More company info	★★★	$699.95	NJ	800-397-8508	Overnight: $9.95+	Y	3/23/2001
Buy Info	Multiwave Direct More company info	★★★	$700.88	CA	800-234-3358	see site	YES	3/24/2001
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Buy Info	Page Computer CNET Certified Store More company info	★★★	$849.00	CA	888-557-2557	14.31	yes	3/24/2001
Buy Info	State Street Direct CNET Certified Store More company info	★★★	$1138.34	NH	800-222-4070	$15.58	In stock	3/25/2001

Re-sort By Price / Sponsor

Shopper.com—a site owned and operated by CNET.com and whose screenshot from 2001 is displayed in Figure 1—is a prime example of such a comparison site. In contrast to first-generation comparison sites relying on shopbot technology, merchants on Shopper.com input their own prices along with the SKU of the product.[25] This innovation went a long way toward solving some of the problems encountered by first-generation comparison sites. First, because merchants input their own data into the comparison site's system, the comparison site could display results from its own database rather than crawling the web. This helped ensure that prices, product availability, and other information were reliable and up-to-date. Second, SKU matching virtually eliminated irrelevant results in product searches. This gave this generation of price comparison sites a significant advantage over web search engines as well as first-generation comparison sites based on shopbot technologies. Finally, the universe of potential

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[25]   Baye et al., *supra* note 22.

sellers was no longer limited to sites actually crawled by comparison sites; retailers were free to choose whether or not to participate in the listings at a particular price comparison site. This significantly increased the number of sellers included in search results at comparison sites. During 2000 and 2001, for instance, a product search at Shopper.com returned an average of seventeen retailers selling the exact same product, and for some products, as many as eighty retailers chose to be included in the list.[26] These innovations, combined with other innovations such as more up-to-date shipping cost information, seller ratings, and the incentives of these platforms to weed out unscrupulous sellers to protect the reputation of their sites (the sites increasingly were supported by click-through fees paid by merchants[27]), rapidly made price comparison sites the "go to" place to find product information—much to the chagrin of traditional shopping portals such as Yahoo!, AOL, and MSN.

In December 2002, Google entered the comparison space with the launch of Froogle.[28] Unlike an evolving number of comparison sites, however, Froogle relied more heavily on shopbot technology rather than establishing relationships with retailers. Presumably, Google surmised that it could leverage its prowess in web search into product search. Apparently this strategy did not work; Google subsequently rebranded its product search offering as "Google Product Search" and—nearly ten years after its initial launch—announced that it was moving to the product listing model that many other comparison sites had been using since at least 2001. According to Google:

> We believe that having a commercial relationship with merchants will encourage them to keep their product information fresh and up to date. Higher quality data—whether it's accurate prices, the latest offers or product availability—should mean better shopping results for users, which in turn should create higher quality traffic for merchants.[29]

By the mid-2000s, price comparison sites had evolved from sites specializing in books, music, or consumer electronics products, to sites with comprehensive product listings that also included clothing, jewelry, appliances, home and garden tools, food baskets, and dozens of other product categories.[30] Shopping.com was the leading price comparison site, with 15

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[26]   *Id.* at 470-72.

[27]   Baye et al., *supra* note 24, at 342-43.

[28]   *Our History in Depth*, GOOGLE, http://www.google.com/about/company/history/#2002 (last visited Aug. 20, 2012).

[29]   Sameer Samat, *Building a Better Shopping Experience*, GOOGLE COM. BLOG (May 31, 2012), http://googlecommerce.blogspot.com/2012/05/building-better-shopping-experience.html#!/2012/05/building-better-shopping-experience.html.

[30]   Mylene Mangalindan, *The Next Generation of Price-Comparison Sites; As Competition Heats Up, Services Add Protection from Fraud, Bigger Discounts,* WALL ST. J. (Sept. 14, 2005), http://online.wsj.com/article/0,,SB112666188907540017,00.html.

million unique visitors in September 2004; the only other product search sites with more traffic were eBay, Amazon, and Yahoo! Shopping.[31]

Thanks in part to the snail's pace with which traditional retailers were moving into the online channel, price comparison sites became "white hot"[32] targets of numerous acquisitions.[33] Acquirers were hoping to leverage their knowledge of online markets, expand the depth and breadth of product listings, and—more generally—profit from their perception that comparison sites would become dominant platforms for conducting product searches and generating online sales. Unfortunately for some of these firms, these expectations were not realized. Yahoo! purchased Kelkoo in March 2004 for $598 million but sold it November 2008 for $125 million; E.W. Scripps purchased Shopzilla for $525 million in June 2005 and sold it in June 2011 for $165 million.[34]

By 2010, traditional retailers came to understand the value of their own information—information not only about prices and inventories, but about different brands, styles, and qualities of similar and complementary products. Traditional retailers followed the lead of Amazon and eBay to create search environments with a blend of "textual," "icon," and "menu" interfaces, and tools such as "recommendations." Thanks to their ability to provide more nuanced information,[35] these product search platforms began to attract greater numbers of users. Additionally, unlike some price comparison sites that had not invested in their own brand identity, and therefore did not receive significant direct traffic but relied on referrals from other sites and web search engines, traditional retailers benefited from their historical investments in brand-name recognition.

By the end of 2010, a variety of competing product search platforms had evolved, each with different strengths and weaknesses. They provided users with similar, but differentiated, search experiences. Moving into the second decade of the millennium, platform competition for users interested in conducting product searches was best viewed as differentiated product competition.

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[31] Initial Public Offering of Shopping.com, NASDAQ.COM (Oct. 25, 2004), http://www.nasdaq.com/markets/ipos/filing.ashx?filingid=3042420.

[32] Matt Rand, *Comparison Shopping on Sale*, FORBES (Dec. 14, 2005), http://www.forbes.com/2005/12/14/bow05121401.html/.

[33] For example, E.W. Scripps acquired Shopzilla; eBay purchased Shopping.com; Experian acquired PriceGrabber; Yahoo! acquired Kelkoo.

[34] *See* Kevin Woodward, *Scripps Sells Shopzilla for $165 Million*, INTERNET RETAILER (Apr. 29, 2011), http://www.internetretailer.com/2011/04/29/scripps-sells-shopzilla-165-million.

[35] "The importance of non-price information about product attributes is now widely recognized." *See* Alizon Luna, *Guided Product Search: How Product Attributes Help Online Retailers Increase Sales*, CHANNEL INTELLIGENCE (Apr. 2007), http://www.channelintelligence.com/resources/Documents/CIWhitePaper_ProductAttributes_May2007.pdf.

IV. POST-2010 TRENDS IN ONLINE PRODUCT SEARCH

This section uses monthly data on consumer search behavior to analyze the evolution of product search in the U.S. between October 2010 and June 2012. Our data analysis is based on the qSearch dataset we obtained from comScore—a leading internet marketing firm that tracks the online browsing activity of 2 million users within the U.S. The qSearch database tracks users' web-search behavior at about 200 online properties, primarily through traditional search boxes and drop-down menus.[36] These 200 properties are broken down into about 1,800 domains and sublevel domains. For example, eBay is one of these 200 properties, and it operates a number of domains, including eBay.com, (the eBay site in the U.S.), Shopping.com, which eBay acquired in 2005,[37] and Dealtime.com, a service of Shopping.com.[38] Amazon is another property tracked by qSearch, and its domains include the U.S. site of Amazon.com, Zappos.com, IMDb.com, and Abebooks.com.

Our analysis exclusively focuses on vertical product search—searches by shoppers seeking to purchase one or more products. Unfortunately, comScore's qSearch data do not indicate the number of *product* searches on a given platform; they simply measure the total number of searches on each platform. For example, qSearch measures the total number of searches on web search engines, but it does not indicate how many of these searches are product searches, navigational searches, weather or news-related searches, and so on. Our analysis therefore excludes these and other sites that consumers primarily use to conduct non-product searches. Other examples of excluded sites are sites that provide general information, such as Wikipedia, USAToday, IMDb.com, Weather.com, and Dictionary.com, and social network sites, such as Facebook and Google+. We also exclude searches for services, such as searches on travel or job-related sites like Expedia.com and Monster.com.

While we do not include searches on web search engines, such as Google.com and Bing.com, or map and broadcast sites, such as Google Maps, Bing Maps, YouTube, and Netflix, we do include searches on sublevel domains explicitly related to product search, such as Google Product Search and Bing Shopping. Additionally, while searches on general

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[36] According to comScore's qSearch documentation, a search is defined as: (1) a user interaction where the user is presented with a search result page containing results that match the consumer's search intent; (2) the search result page allows the user the ability to refine or change their search parameters; and (3) the search can be initiated from a drop-down or by clicking a link, as long as first two rules are satisfied. *See* qSearch, COMSCORE, http://www.comscore.com/Products/Audience_Analytics/qSearch.

[37] Press Release, eBay Completes Acquisition of Shopping.com, EBAY INC. (Aug. 30, 2005), http://investor.ebay.com/releasedetail.cfm?releaseid=171732.

[38] *See About Dealtime.com*, DEALTIME, http://www.dealtime.com/sc/aboutDealtime (last visited Dec. 19, 2012).

corporate websites, such as Apple.com, are excluded, we do include searches on product-related sublevel domains of these sites, such as the Apple Store.

We reviewed the 1,800 sites tracked in the qSearch database and organized product searches at these sites into three broad categories: searches on (1) price comparison sites, (2) retailer sites, and (3) marketplace/other sites.[39] Price comparison sites include sites such as PriceGrabber, Bing Shopping, and Google Product Search; these sites typically do not sell products or fulfill orders but instead present shoppers with a list of prices that different sellers charge for a given product. As discussed earlier, this price information is typically bundled with other information—including shipping costs, the reputation of the seller, and other product characteristics—to aid shoppers with their purchase decisions. When a consumer clicks on a particular retailer listed at a price comparison site, she is typically directed to that retailer's site to complete the transaction.

Retailer sites include the online arms of traditional retailers, such as Best Buy, Walmart, and Target, as well as pure online retailers, such as Zappos.com. Unlike price comparison sites, these sites typically sell products from the company's inventory. The third category—marketplace/other sites—includes marketplaces like eBay.com, coupon and deal sites such as coupons.com and slickdeals.net, and review sites such as epinions.com. Sites within this category are highly differentiated and evolving. The most prominent site in this category is eBay.com. Unlike retailers, it does not sell products from its own inventory. Unlike price comparison sites, transactions typically take place on the platform rather than at the site of an individual retailer. We note that eBay and many other sites in this category now have features that permit shoppers to compare the prices—along with other characteristics, such as rebates—of products sold by different sellers. However, sites in this category differ from traditional price comparison sites in that price comparisons are not the central focus of these sites. Rather, this relatively new feature is an example of the continuing evolution of product search environments at marketplace/other sites.

It is important to note that some properties operate product search sites that span more than one of these three categories. For example, searches on eBay's Shopping.com and Dealtime.com sites are included in the price comparison site category, while searches on eBay's main U.S. site, eBay.com, are included in the marketplace category. As another example, searches on Amazon's Zappos.com site are included in the retailer site category; searches on Amazon's Abebooks.com site are included in the price comparison site category.[40]

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[39]   Appendix A1 provides a list of the sites included in our analysis.

[40]   Recall that searches on Amazon's IMDb.com site, a general information site about movies, are excluded from our analysis.

With a few exceptions, the data permit us to assign product searches on sites tracked by qSearch into one of the three categories. One notable exception is Amazon; the qSearch data do not permit us to decompose searches on Amazon.com into the "retailer sites" and "marketplace/other sites" categories. Amazon has evolved such that it is both an online retailer—it sells products from its own inventory—and a marketplace—it fulfills orders for its Amazon Marketplace sellers. Today, product searches on Amazon.com typically return products sold by Amazon as well as products sold by its Marketplace Sellers. For purposes of our analysis, all searches on Amazon.com are allocated to the "retailer site" category regardless of whether the searches were related to its own products or products sold by marketplace sellers.

Figure 2 displays the evolution of product search, measured in millions of search visits, for each of the three categories between October 2010 and June 2012.[41] Several features are worth noting. As would be expected, there is some seasonal variation in search visits during the sampling period, most notably the increases during December. Second, the overall number of search visits at price comparison sites remained fairly constant over this period, starting with 73 million search visits in October 2010 and ending with 75 million search visits in June 2012. In contrast, the number of search visits at retailer sites increased by about 300% during the period, from 98 million in October 2010 to 298 million in June 2012. Likewise, search visits at marketplace/other sites increased from 174 million in October 2010 to 244 million in June 2012. On balance, Figure 2 shows that: (1) retailer sites, marketplace/other sites received significantly more search visits than price comparison sites; (2) retailer sites, marketplace/other sites enjoyed significant growth over the past two years; and (3) searches at price comparison sites have remained fairly flat over the past two years, and actually declined during the first half of 2012.

The patterns of product search presented in Figure 2 suggest that shoppers are increasingly viewing retailer and marketplace sites as the "go to" places for conducting product searches. In particular, recall that a successful product search at a price comparison site ultimately directs a shopper to a retailer's site where consumers may engage in additional product search. Since product searches at price comparison sites are stable over the period, Figure 2 suggests that the growth in product searches at retailer and marketplace sites does not stem from increases in referrals from comparison sites, but from shoppers directly going to retailer and marketplace sites to conduct product searches.

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[41] According to comScore's qSearch documentation, a search visit is a session in which a user conducted one or more searches. If searches are conducted at different points during the day, with more than thirty minutes of search inactivity at the site, they will count as multiple search visits. *See* COMSCORE, *supra* note 36.

**Figure 2. Evolution of Search Visits at Retailer Sites,
Price Comparison Sites, and Marketplace/Other Sites:
Unbalanced Panel**
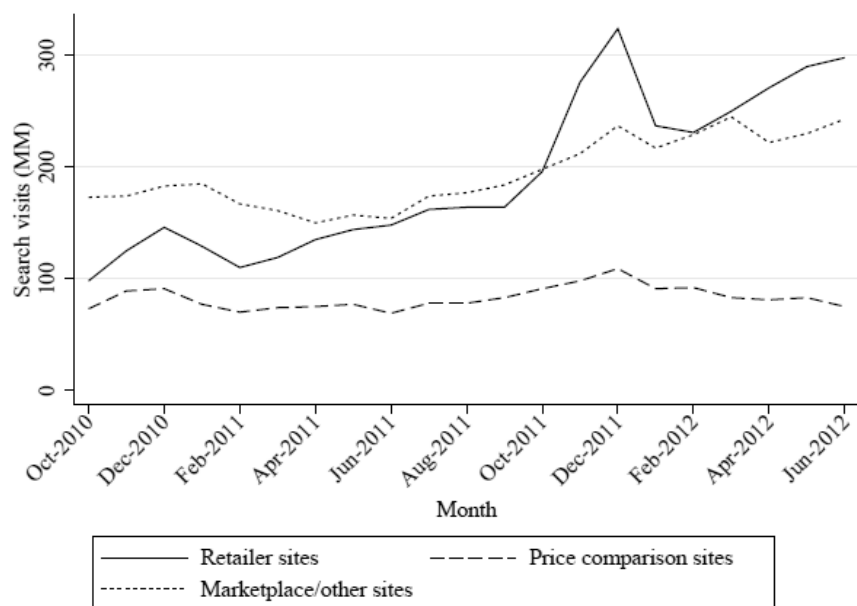
One potential worry found in Figure 2 is that the data are comprised of the unbalanced panel of product search sites included in the qSearch data. In particular, qSearch includes properties only if the number of searches exceeds a certain threshold. As a consequence, platforms enter and exit the qSearch sample during the sample period. Figure 3 displays results based on a balanced panel; it is based solely on product search sites that remained in the qSearch database for the duration of the sample period. As shown in the figure, the patterns are similar to those in Figure 2. Holding the set of product search platforms constant, retailer sites, marketplace/other sites displayed significant growth over the past two years, while search visits at price comparison sites remained flat and actually declined substantially during the first six months of 2012.

**Figure 3. Evolution of Search Visits at Retailer Sites,
Price Comparison Sites, and Marketplace/Other Sites: Balanced Panel**
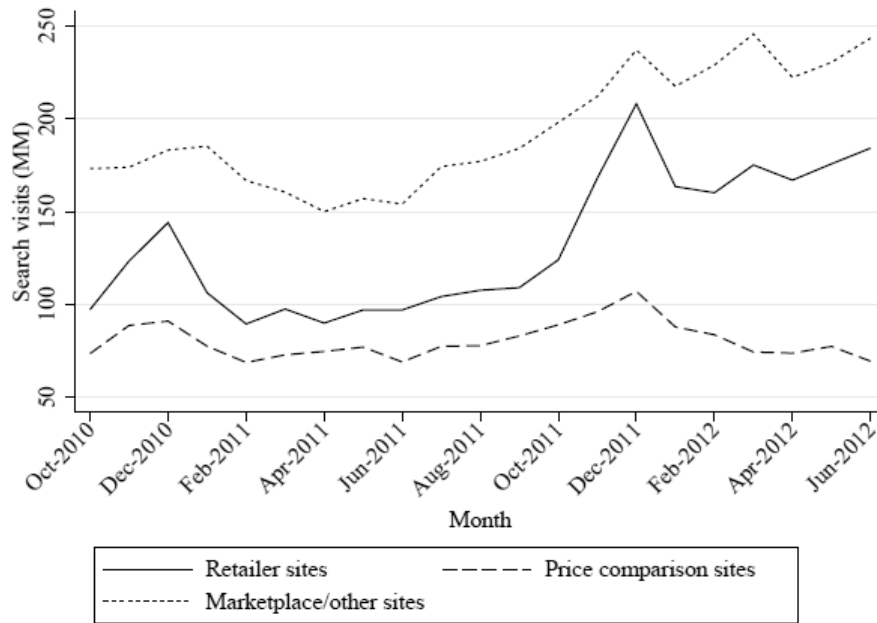
The marketplace/other sites category in Figures 2 and 3 does not include searches on Craigslist because the qSearch data do not permit us to disentangle product searches from non-product searches—e.g., searches for jobs, personals, housing, and other services. Nonetheless, as illustrated in Figure 4, search activity on Craigslist closely mirrors that of the marketplace/other sites category, indicating that the overall trends displayed in Figures 2 and 3 are not the result of excluding Craigslist from the analysis.
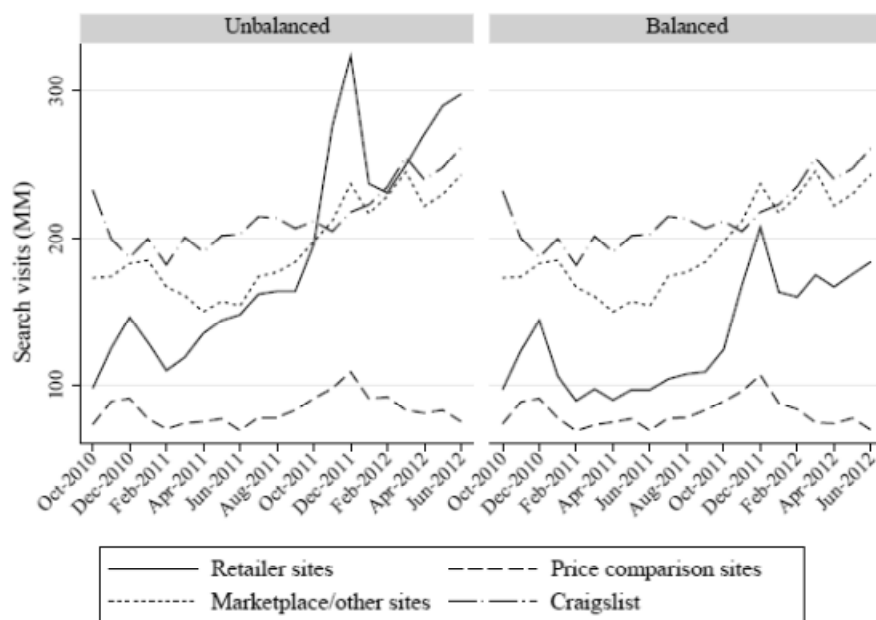
Figure 4. Evolution of Search Visits, With Craigslist

Table 1 provides summary statistics for the total number of product searches conducted on retailer sites, price comparison sites, marketplace/other sites, and Craigslist. In June 2012, consumers using browsers conducted 877 million searches at marketplace/other sites and an additional 737 million searches on Craigslist. Retailer sites amassed 634 million searches, while price comparison sites mustered only 134 million searches.

Table 1 also shows how searches at these platforms vary across heavy searchers, medium searchers, and light searchers.[42] The bulk of all searches in each category are conducted by so-called heavy searchers—the top 20% most active searchers in terms of the number of searches performed each month. Heavy searchers account for 71% of all product searches at marketplace/other sites, but account for only 57% of all product searches at retailer sites. In contrast, Table 1 also shows that price comparison sites and retailer sites are very similar in terms of their mix of heavy, medium, and light searchers.

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[42] These categorizations are based on comScore's classification of searchers; comScore defines the heavy searchers as the top 20% most active searchers in terms of the number of searches during a month. The light searchers are defined as the 50% least active searchers. *See id.*

Table 1. Product Searches by User Type, June 2012

	Searches (MM)	Percentage of product searches by user type		
		heavy searcher	medium searcher	light searcher
Retailer sites	634	57	31	11
Price comparison sites	134	60	29	11
Marketplace/other sites	877	71	24	5
Craigslist	737	70	24	6

The total number of searches summarized in Table 1 for June 2012 is the product of search visits—displayed earlier in Figure 3—and the number of searches per visit during that month—displayed in Figure 5. Notice in Figure 5 that, for each category, searches per visit remained relatively constant during the sample period. This implies that trends in total searches for the three categories are similar to those shown for search visits in Figure 2. Figure 5 also demonstrates that a typical search visit at marketplace/other sites results in more searches—slightly more than 3 searches—than at retailer sites—less than 2.5 searches—or price comparison sites (about 1.75 searches).

**Figure 5. Evolution of Searches per Visit at Retailer Sites,
Price Comparison Sites, and Marketplace/Other Sites**
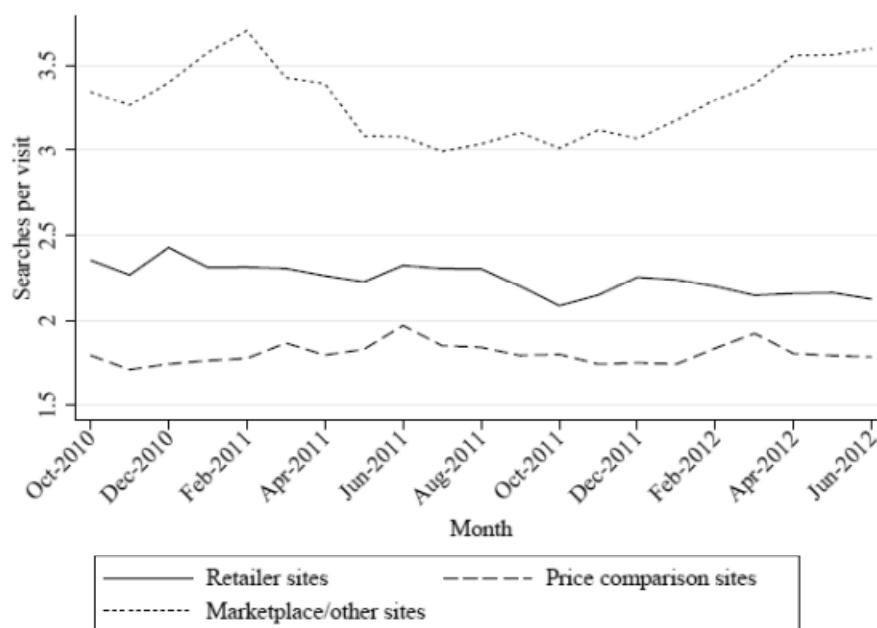
CONCLUDING REMARKS

Product search is dynamic, with evolving technological approaches and considerable turnover in both the importance of different platforms and the identity of key players. Price comparison sites were once the dominant platform for conducting product search. Today, the number of searches conducted on retailer sites and marketplace/other sites dwarf searches at comparison sites. In the beginning, eBay was a marketplace for buyers and sellers of used products, but today, about 70% of the products listed there are new. Amazon was once an online retailer that specialized in selling books and music from its own inventory; today it sells not only a wide array of general merchandize, but it serves as a marketplace where shoppers can search across a growing number of independent sellers. Additional evidence of this evolution is the fact that comScore recently started including product searches at Walmart.com in its qSearch database.

The overall trend—a trend that is continuing into the second decade of the millennium—is that retailer and marketplace/other sites are becoming the "go to" place for conducting product searches. Additionally, shoppers search more intensely at retailer sites and marketplace/other sites, resulting in significantly more overall searches at these sites than at price comparison sites. We note that our data and analysis are based on product search activi-

ty taking place in the U.S. It is therefore difficult to say whether the shift toward retail and marketplace sites is a global phenomenon, or is only local to the U.S. One development that suggests this trend might be a global phenomenon is the fact that several of the major sites in our data operate foreign subsidiaries that have evolved in ways similar to their U.S. counterparts. For example, Amazon.co.uk in the United Kingdom and Amazon.de in Germany now sell a wide variety of different products from their own inventories as well as from other sellers. In addition, eBay.de transitioned from auctions of used goods to a marketplace where consumers can purchase new items at a posted price.

We conclude with some caveats that highlight a few of the challenges in measuring online product search. First, product search platforms are differentiated, and each has advantages and disadvantages. Some sites rely more heavily on textual searches, while others supplement textual search with opportunities for shoppers to use pull-down menus, navigate directories, or take advantage of product recommendations. In addition to typing product queries into traditional search boxes, consumers use directories, menus, and different filtering and sorting tools to search for products. Most of these non-textual searches are not observed, as they often involve consumer clicking behavior. This may bias measurement in favor of platforms that heavily rely on textual searches relative to platforms that are designed to allow consumers to engage in non-textual searches.

Second, because platforms are differentiated, care must be taken in comparing the total number of searches on one platform with the total number on another. For example, it might take a shopper only one search on platform A to obtain relevant results; on platform B it might take four searches. In this case, for a given number of search visits, platform B would have four times as many searches as platform A. We have attempted to overcome this problem by focusing on search visits rather than total searches. To the extent that higher quality search platforms generate more search visits, one would expect higher quality sites to have more search visits than lower quality sites, even if the overall number of searches is lower on high-quality sites. In any case, our data indicate that the trends in search behavior at price comparison sites, retailer sites, and marketplace/other sites are similar regardless of whether one uses search visits or total searches to measure product searches.

Additionally, owing to the differentiated nature of the product information returned by searches at various platforms, a given number of searches might ultimately result in better purchase decisions on one platform than on another. Platforms differ with regard to the amount of time shoppers must invest in evaluating results pages, including seller reputations, shipping charges, payment options, return policies, and distinct product descriptions that contain other potentially important information about a product, such as whether it is new or used. Measures of searches on differ-

ent platforms—be they numbers of searches or market shares—typically do not take these and other "search quality" issues into account.

Another difficulty in measuring product search is accounting for the universe of *potential* product searches. For instance, comScore's qSearch only tracks searches conducted using traditional, non-mobile web browsers. Increasingly, however, consumers are using other systems, e.g., iTunes, and applications, e.g., Amazon's Price Check and Sam's Club applications, to conduct product searches. The challenge with these systems is that they tend to be closed and in some cases mobile, making it more difficult to accurately measure product search activity on the universe of available platforms. While the absence of reliable data on mobile search activity led us to focus exclusively on non-mobile product search, to the extent that those conducting mobile searches use retailer or marketplace applications, such as Amazon Price Check, while in their local store—or search in a manner similar to those using desktops—the results would be similar. Nonetheless, this remains an open empirical question that would be interesting to examine when reliable data are available.

Finally, it is extremely difficult to disentangle product search from other types of search. We have attempted to overcome this difficulty by focusing exclusively on sites tracked by qSearch that specialize in helping consumers conduct product searches. In so doing, we have excluded searches on the many small retailer sites that are not tracked by qSearch, as well as searches on newspaper and other sites that are potentially related to product search. Our rationale for excluding these latter sites is that most of the searches on these sites are unlikely related to product search. In future research we hope to use other data to more closely explore these issues, including the nature of product search conducted on web search engines.

Appendix A1. Sample of Product Search Sites

Price Comparison Sites	*Retailer Sites*	*Marketplace/other sites*
abebooks.com	amazon.com	bensbargains.net
aol shopping	americangirl.com	cnet reviews
ask shopping search	barnesandnoble.com	consumersearch.com
become.com	buy.com	coupons.com
beso.com	cb2.com	dealam.com
bing shopping	circuitcity.com	dealio.com
bizrate.com	compusa.com	deals2buy.com
bookfinder.com	crateandbarrel.com	dealsofamerica.com
bottomdollar.com	dell.com	dealspl.us
buycheapr.com	disney shopping	digcoupons.com
calibex.com	gamespot.com	ebates.com
cnet shopper.com	globalcomputer.com	ebay.com
compare.com	jcpenney.com	epinions.com
dealnews.com	kmart.com	fatwallet.com
dealtime.com	kobobooks.com	goodguide.com
etsy.com	landofnod.com	groupon.com
google shopping/product search	microsoftstore.com	half.com
lowpriceshopper.com	newegg.com	overstock auctions
lycos shopping	officedepot.com	passionforsavings.com
mysimon.com	overstock.com	shopathome.com
nextag.com	samsclub.com	slickdeals.net
ohdeal.com	sears.com	toptenreviews.com
preciomania.com	shopping.hp.com	trustedreviews.com
pricedumper.com	staples.com	wize.com
pricegrabber.com	target.com	woot.com
pricewatch.com	techdepot.com	yahoo! deals
pronto.com	tgw.com	
shoplocal.com	the apple store	
shopping.com us	tigerdirect.com	
shoptrue.com	walmart.com	
shopzilla.com	zappos.com	
smarter.com		
techbargains.com		
thefind.com		
toyssale.com		
yahoo! u.s. shopping		