The Role for Economic Analysis in the FTC's Google Investigation

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I. Introduction

In January 2013, the Federal Trade Commission closed its nineteen month investigation focusing on whether alleged "search bias" by Google violated US antitrust law.[1] According to the FTC's brief closing statement, the bias allegations were that "Google unfairly preferences its own content on the Google search results page and selectively demotes its competitors' content from those results." The closing statement went on to explain that the key finding that convinced the FTC to close its investigation was that Google did not change "its search results primarily to exclude actual or potential competitors." Instead, it concluded, "The totality of the evidence indicates that, in the main, Google adopted the design changes that the Commission investigated to improve the quality of its search results."[2]

This explanation by the FTC of what it investigated contains two distinct components. One is whether Google explicitly demoted its competitors' Web sites on its search engine results pages ("SERP") (and did so to thwart the competitive threat they posed rather than out of a concern with the quality of the sites for Google users). The other is whether Google's search algorithms and the rankings of results displayed on its SERPs "unfairly" preference Google "properties." This paper analyzes these allegations from an economic perspective. Neither the specific allegation of demotion nor the general allegation of bias fits neatly into standard categories of antitrust violations like predatory pricing or exclusive dealing. An important role for economic analysis is to provide an appropriate analytical framework which can then serve as a guide for what factual foundation one would need to establish a violation in this case.

The FTC's closing statement says that it had received complaints about Google's alleged unfair preferences on its SERP for its own thematic search results, which the FTC labeled as "properties." This would seem to suggest that the economic theory underlying the complaints was that Google leveraged its (alleged) market power in the (alleged) market for general search into thematic search markets. We will

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[1] The FTC investigation covered some issues besides Google's use of Universals. These issues included "scraping," Google's AdWords API, and standard essential patents. The aspect of the investigation that drew the most attention concerned Google's use of Universals.

[2] Statement of the Federal Trade Commission Regarding Google's Search Practices, *In the Matter of Google Inc.*, FTC File Number 111-0163, January 3, 2013, available at http://ftc.gov/os/2013/01/130103googlesearchstmtofcomm.pdf (last accessed June 3, 2013) ("FTC Closing Statement").

argue, however, that the leveraging perspective does not withstand economic scrutiny in large part because general search is not a relevant market. Once one dismisses the leveraging theory, the allegations boil down to a claim that Google's innovations were anticompetitive. While such claims might not be logically absurd, the FTC would likely have faced an overwhelming burden to establish that Google's innovation, which is normally considered competitive behavior, was actually anticompetitive.

By its own account, the FTC staff examined nine million documents and talked with a large number of industry participants. Even if that material were public, which it is not, it would be difficult without much more than a four-page closing statement to understand how the FTC weighed the evidence to arrive at its conclusion. Thus, while we cannot know why the FTC acted as it did or what role economics played in its decision, economic analysis can reveal why it was wise to close its investigation. Moreover, one can reach this conclusion without access to the full set of evidence available to the FTC. We will argue that the case was virtually doomed from the start on conceptual grounds. Had the FTC brought a case, it likely would have risked a fate similar to the outcome in *Matsushita*[3] in which the court dismissed a massive evidentiary record on the grounds that the allegations made no economic sense.

The remainder of this paper is organized as follows. As the FTC closing statement explained, the allegations against Google related to its so-called "Universals" like "Shopping" or "Local." Section II explains what Universals are and the allegations that Google's use of them is or was biased. Section III discusses search algorithms and search innovation. Section IV, which is divided into three parts, covers the role of economics in providing a conceptual framework for the case. The first part presents a simple model of the economics of Google. The discipline of modeling, which forces a focus on the most essential aspects of Google's business, elicits points that are crucial to assessing the allegations against Google. The model makes it clear that even though Google is a general search engine, search conducted on general search engines is not a relevant antitrust market. Another key point that the model clarifies is that Google is a two-sided business, but it is not a three-sided business. The two groups of Google customers are people who search on Google and advertisers. The Web sites that would like to appear in Google search results receive (external) benefits from Google, but they are not Google's customers. The second part of Section IV discusses what it would mean to model Google's use of

[3] *Matsushita v. Zenith Radio Corp.* 475 U.S. 574 (1986).

Universals as leveraging market power from one market to an adjacent market. There have been and continue to be episodes of Google search that start at Google and then move to a so-called "vertical"[4] search site. While these episodes of search have two stages, a leveraging model makes no sense because neither the two-stage process as a whole nor the individual steps constitute markets (either as economists use that term generally or as a matter of antitrust law), as would be necessary to formalize the leveraging claims. The third subsection discusses on a conceptual level what sort of factual support the FTC would have needed to justify a case, recognizing that antitrust standards necessarily reflect decision-theoretic principles. At a minimum, the FTC would have had to show that (1) Google used Universals in ways that lowered search quality, (2) in so doing, Google did not increase advertising revenues, and (3) Google's objective in doing so was to exclude competitors. Moreover, to be consistent with established Supreme Court doctrine on predatory pricing, courts may have insisted further that the FTC show a dangerous probability of success. Section V turns to the empirical assessment of whether Google's search results are "biased" toward the form of search result that was most prominently highlighted by its critics: Google's "Universals."[5] This section explains why it is not possible to measure bias objectively and, therefore, why the empirical investigation had to be about Google's intent. Consistent with the theoretical discussion in Section IV, so long as Google developed and used its Universals to improve the quality of its search for users or even if it developed them to increase its advertising revenue, it was behaving competitively. Absent any evidence that Google used Universals to exclude competitors, the FTC did not have to consider whether such efforts had a dangerous probability of success.

Section VI concludes. Ultimately, the FTC needed to weigh Google's arguments that competitors were complaining about improvements to its products against perhaps superficially plausible but ultimately untenable allegations that Google was using Universals to leverage market power (which it does not have) in a "market" (that is not in fact an antitrust market) into an "adjacent" market. Once one recognizes that the case was ultimately about whether Google innovation was anticompetitive, it becomes clear that the FTC would have faced a difficult burden of proof had it taken its allegations to court. The prospect of devoting substantial enforcement resources to a losing effort was not, however, the only or

[4] See Section II *infra* for the meaning of a vertical search site.
[5] We define and explain Google's Universals in Sections II and III(F), *infra*.

even the most important reason the FTC was wise to close its investigation. Prevailing in court would have been an even worse outcome, as any injunctive relief would have required the FTC and/or a court in effect to regulate Google's search innovation.

II. Universal Search

To quote from the FTC's closing statement:

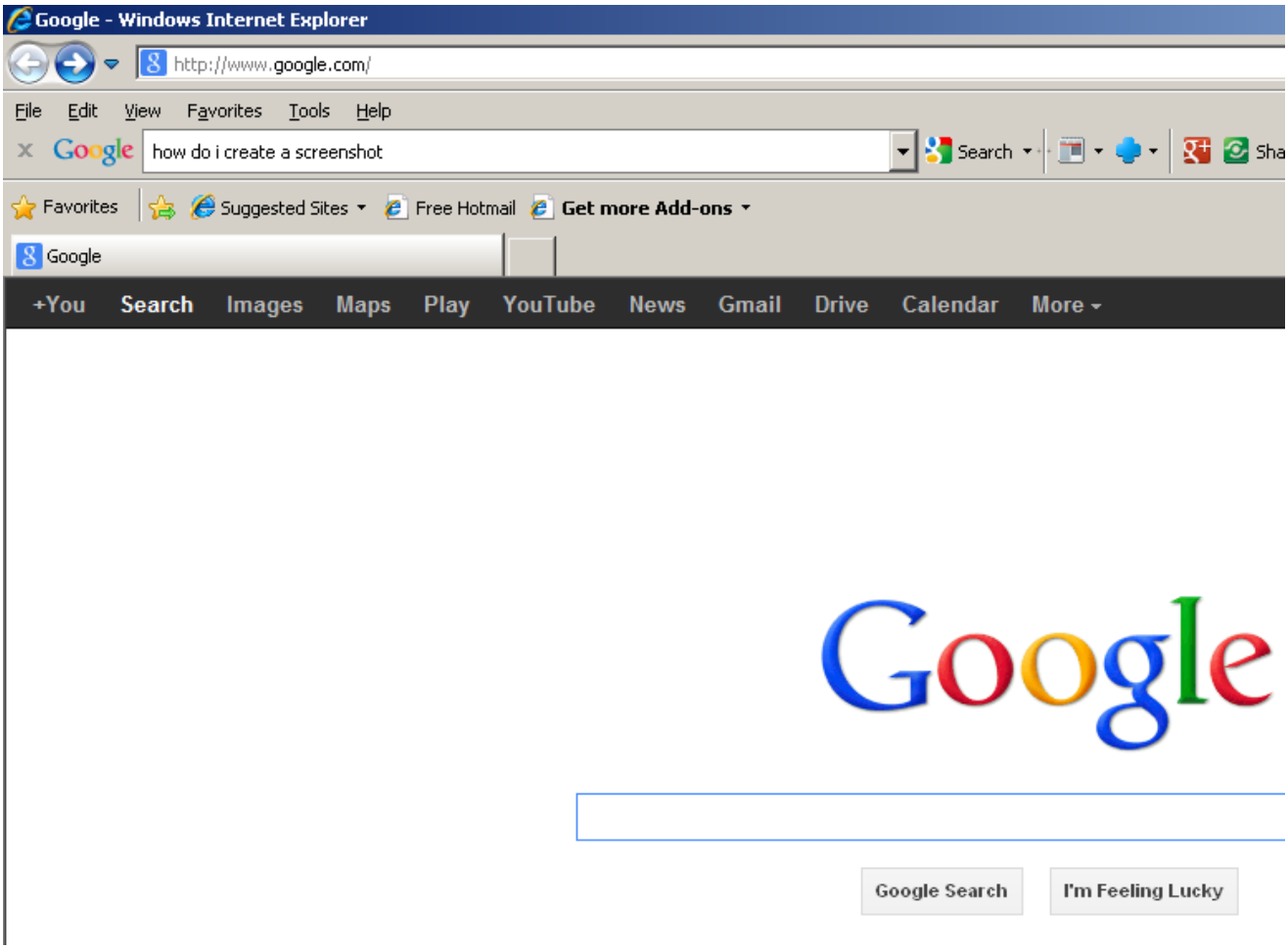
> Some vertical websites alleged that Google unfairly promoted its own vertical properties through changes in its search results page, such as the introduction of the "Universal Search" box, which prominently displayed Google vertical search results in response to certain types of queries, including shopping and local.[6]

Before going to the substance of these concerns, it is necessary to deal with issues of nomenclature. While the term "vertical" seems to imply a relationship to "vertical integration" or "vertical foreclosure," a "vertical website" is a specialized search site. Examples include Travelocity (travel), Orbitz (travel), CNET (electronics shopping),[7] Yelp! (local businesses), NexTag (shopping), and Fandango (movie information).

To understand what "Universal Search" is, consider Figure 1, which is a screen shot of the upper-left hand side of the Google home page as it appeared at the time of this writing. The black bar near the top includes hyperlinks labeled "You," "Search," "Images," "Maps," "Play," "YouTube," "News," "Gmail," "Drive," "Calendar," and "More." The selection labeled "Search" is in a boldface font because the page being viewed is the Google Search screen.[8] This screen is a point of entry for users to Google's general search engine. Google's search engine is referred to as a "general" search engine because it is capable of providing answers to any conceivable search term issued by the user, among other things on the basis of Google's practice of "crawling" the entire Web.

[6] FTC Closing Statement, note 2, *supra*.
[7] CNET is not just a shopping site as it also publishes content about the electronics and information technology. But it is a good site for looking for electronics shopping.
[8] The bolder font may not clear in the screenshot, but it is clear when one uses Google.

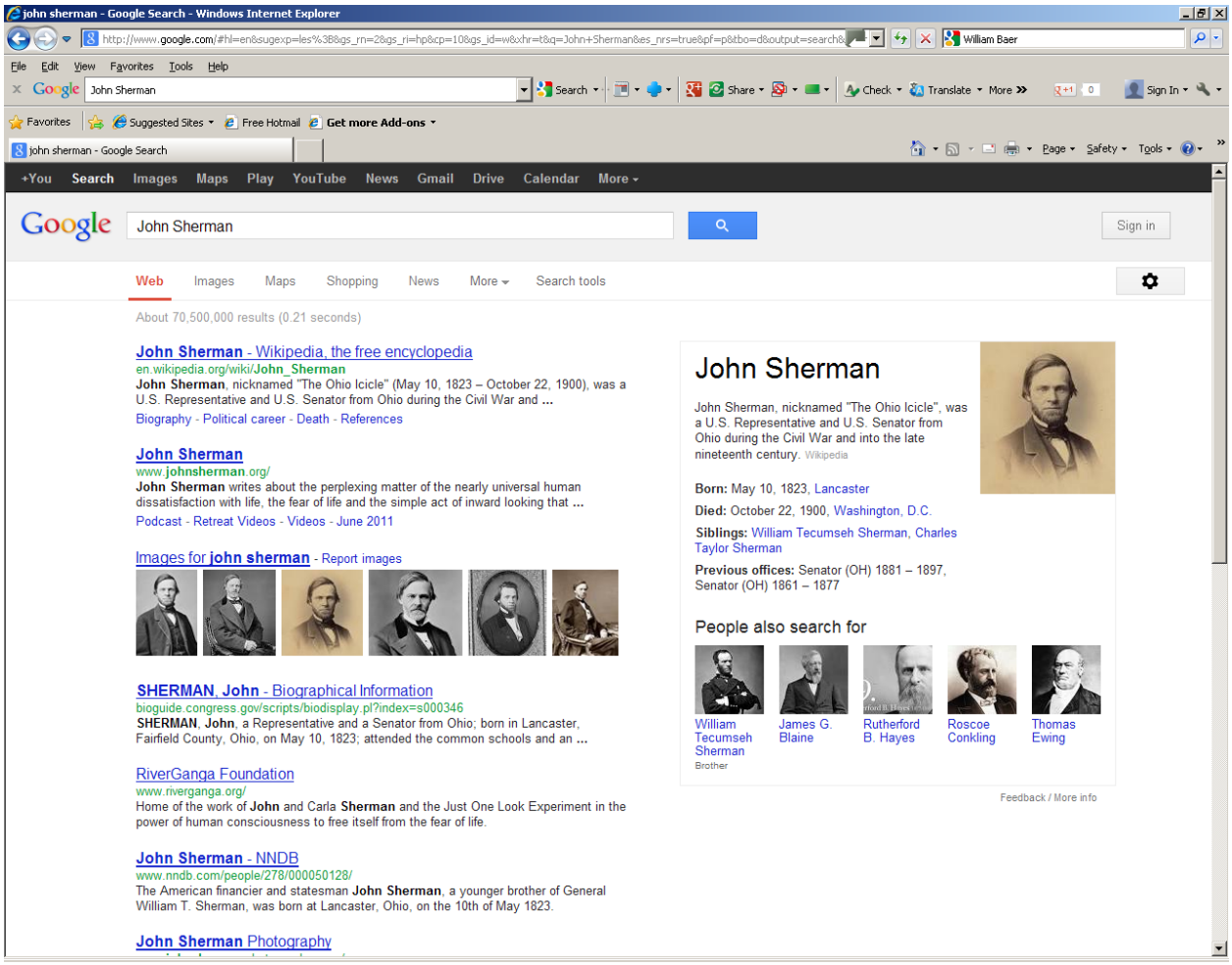
Figure 1



Suppose one is interested in pictures of John Sherman, the sponsor of the Sherman Antitrust Act. One way to find such pictures is to type "John Sherman" into the search box on this Search page. Figure 2 displays the results we recently obtained.[9]

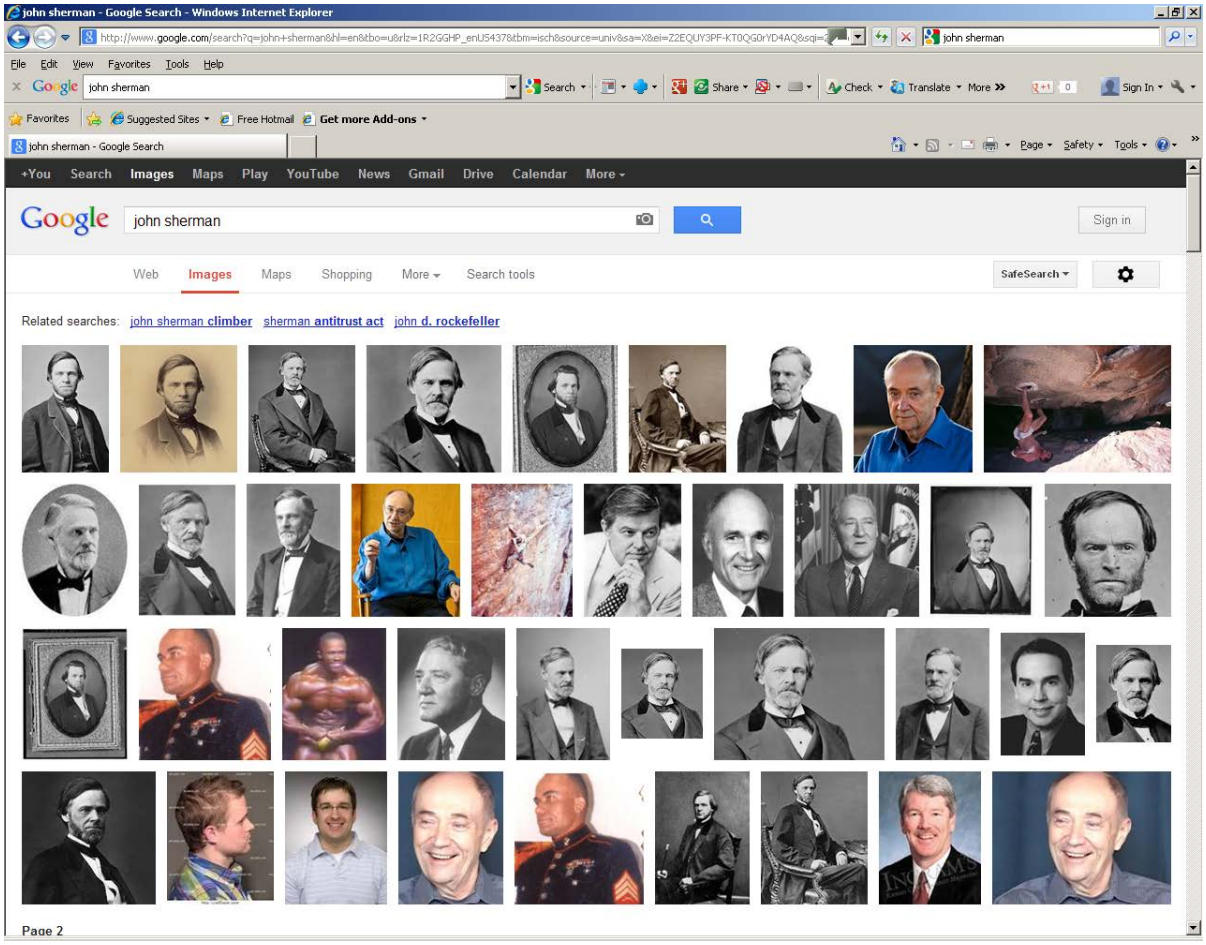
[9] Not only do Google results change over time (both because of changes in its algorithms and changes in available content), but they can vary by user (based, for example, on location or search history). Someone else attempting the searches we describe may get different results.

Figure 2



The third item down on the left hand side says, “Images for john sherman – Report images” and has six images below it. Figure 3 shows the result of clicking on the “Images for john Sherman” blue link.

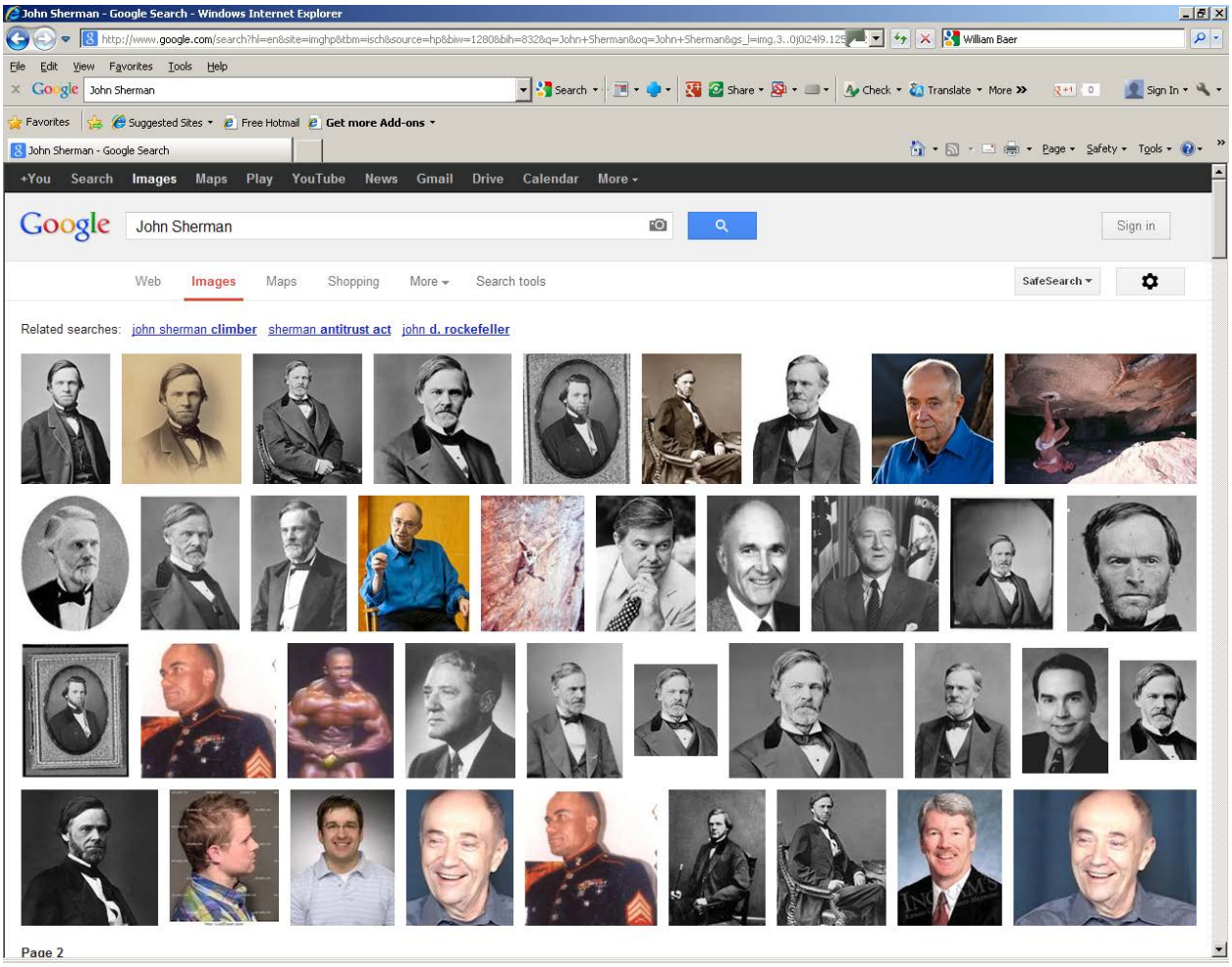
Figure 3



Another way to obtain such images is first to click “Images” in the black menu bar on the main Google search page, then type “John Sherman” into the search box.[10] Figure 4 shows the results from doing so. The key point about Figure 4 is that it is identical to Figure 3.

[10] Note that “Images” is now brighter than the other words in the black bar.

Figure 4



Figures 2-4 provide an example of one type of Universal Search result, in this case the "Images Universal." Figure 2 shows the results of a "general search" (Google currently calls a "Web" search). Figures 3 and 4 show the results from one of Google's thematic searches.[11] A Universal Search result is a link to the results of one of Google's thematic search algorithms in the results of Web Search. Google's Images Search is an example of what the FTC closing statement refers to as a Google "property."

[11] In Figures 1-4, the black rectangle near the top of the page says, "… Search Images Maps Play YouTube News ….." Each is a clickable "tab" that leads to a page with a search bar (as well as content in the case of Maps, Play, YouTube and News). The same query in these different tabs yields different results because Google uses different algorithms to generate them. As described above, "Search" is Google's general search. Searches in the other tabs are thematic searches. For example, a search in the "Images" yields results based on an image theme, meaning that the results are images. In addition to being based on a different algorithm, a thematic search might be based on a more limited set of crawled sites.

Unlike the Images Universal, which was not a focus of the Commission's investigation, Google's "Shopping" and "Local" Universals were identified in the FTC closing statement as having been the subject of complaints from competing "vertical" Web sites. Shopping and local "vertical" search sites[12] that valued placement in Google's Web search results had complained that Google's algorithms placed its Shopping and Local Universals above links to their sites. They seem to have argued that Google should be required to treat its Universal Search results as Web pages to be ranked according to the same general Web search algorithm Google uses to evaluate their sites, and that, had Google done so, the links to their sites would appear above (or appear above more frequently) Google's Shopping or Local Universals. They contend that the effect of this would have been to attract more user traffic to their sites.

III. Search Engines and Search Engine Innovation

The Internet gives people access to a trove of information; but for that access to be useful, people have to be able to locate the information they want. Exactly how people would be finding the information they want on the Internet in 2013 was not obvious in, say, 1995; and exactly how they will do so in 2023 (and perhaps even 2015), is not completely obvious today.

A. Early Internet Search

One of the earliest Internet services was AOL. It tried to create a relatively closed environment in which access to news, shopping, travel, and other sorts of information services were within AOL. While successful with that approach for a while, AOL ultimately had to abandon it because people wanted access to the information available more broadly on the Internet rather than being constrained to AOL's offerings.

[12] We are not privy to the identities of all the complaining publishers of "vertical" Web sites, but Foundem and NexTag are examples of shopping sites whose publishers have complained publicly about Google bias. Speaking more generally, there are many "vertical" Web sites that provide specialized search capabilities tailored to specific user wants. Examples of "vertical" sites that compete with Google's Local Universal, in that they provide links to local businesses, include Yelp! (providing reviews and links to local restaurants, shopping, entertainment venues and services), OpenTable (providing links and reservations to local restaurants); and Yahoo! Local (listings of local businesses, services and events). Examples of "vertical" sites that compete with Google's Shopping Universal include Amazon.com (which needs no introduction); Yahoo! Shopping; and Shopping.com.

Yahoo! provided another early approach to locating information on the Internet. At its inception in 1994, Yahoo! was a catalogue of Web sites where people could click on different themes (*eg*., Sports or Shopping, say) and then, within each theme, subthemes (*eg.*, baseball or football within Sports and clothing or electronics within Shopping). In contrast to AOL, Yahoo! tried to help people locate the best information available on the Web. A fundamental problem with that approach, however, was that it required humans to catalog the available information. As early as 1996, when Yahoo! added search capability, the amount of information available on the Internet had grown to make that approach impractical.

The earliest versions of AOL and Yahoo! were not search engines as we use the term today because they could not respond to search queries. They were, however, general search sites (as distinct from general search engines) as they were starting points to look for information on the Internet. Here, the term "general" is similar to its meaning in "general store." One does not go to a general store to buy something general. Each trip is to buy one or more specific items. But there are a wide variety of specific items one might purchase at a general store. Similarly, there is no such thing as an episode of general search. All (or at least virtually all) searches on the Internet are for specific information. AOL and Yahoo! could be the starting point to search for many different types of information - news, sports, shopping, and travel, to name just a few. Their approach to being useful for a wide range of searches was to have categories devoted to specific types of information. That is, the cataloguing approach to helping people find information on the Internet virtually requires a thematic structure that resembles more recent thematic approaches to search.

B. First Generation General Search Engines

The first general search engines were Lycos and WebCrawler, both of which were introduced in 1994. AltaVista was launched in 1995, and was initially quite successful. Several other general search engines started in the mid-1990's.[13]

As we use the term, a first-generation general search engine had three defining characteristics. First, unlike the initial versions of AOL and Yahoo!, users could search by entering a query term. Second,

[13] For a discussion of early Internet search sites, see Sullivan (2003).

it used Web crawlers to access and catalog the (in principle, at least) entire Web (or at least the entire "surface Web"[14]). Third, its response to a query was a list of Web sites that the user issuing the query might find helpful. This first generation of search engines had advantages and disadvantages over other ways of locating information on the internet. Because they are automated, Web crawlers can access information far faster and more comprehensively than is possible using a cataloging approach like the one Yahoo! used when it started. On the other hand, a fundamental challenge for general search engines is how to link queries to the information catalogued by the Web crawler.

A purely algorithmic approach to the second step assigns for each query a numerical score designed to measure the likely value of the site to the person performing the search.[15] The search engine then sorts the scores in descending order, placing the Web site receiving the top score first, the one receiving the second score second, and so on. An example of a very simple algorithm would be to use the number of times the search term appears on a Web page as the ranking criterion.[16] If one issued a query for Barack Obama to a search site using that algorithm, the first page listed would be the Web page containing the name "Barack Obama" the most times, the second site would be the Web page containing the name "Barack Obama" the second most times and so on.

This simple example illustrates four essential points about search and search algorithms. First, algorithms have to be based on measurable criteria that are not subject to human intervention.[17] In the context of our hypothetical algorithm, there is some site on the Web that says "Barack Obama" the most times, some site that says "Barack Obama" the second most times, and so on. Second, and related, the

[14] See the discussion of the "surface Web" and "hidden Web" in Subsection C below.

[15] One approach to search would be to have human-generated answers to some queries (perhaps augmented by machine-learning about which answers users clicked on) and then supplement those with results based on Web crawling and algorithms for which the site did not have human-generated answers. When it started in 1998, Ask Jeeves used this approach.

[16] The science of assessing the relevance of documents for queries is known as "Information retrieval." Bush (1945) is credited with having introduced the idea of a systematic approach to information retrieval. One of the earliest approaches suggested in the 1950's was based on word overlap. The science had advanced well beyond that by the mid-1990's, although the appearance of query terms in a document continues to be an important consideration. The earliest Web browsers made use of developments up to that time. See Singhal (2001) for a discussion.

[17] That is, there is no human intervention at the time of the search. The design of the algorithm can entail human intervention, which can range in terms of how "heavy-handed" it is. One form of intervention is to augment or diminish the scores given particular sites. A still more heavy-handed approach would be to program directly the response to a particular query (without any reliance on a formula calculated about each crawled page). Of course, any change in an algorithm designed to modify Google results is arguably human intervention.

measurable information that one can incorporate into a computer algorithm is only a proxy for how valuable a user finds a Web site for providing the information he was looking for. The number of times the query terms appear on a page is simpler and more naïve than what a modern search engine would use as the sole basis for matching Web sites to queries, but even the scores generated by more sophisticated algorithms that have been (and will be) developed are proxies for, rather than direct measures of, the quality of the match between a site and a query. Third, different people issuing the same query are not necessarily looking for the same information (or, to use a term of art, may have different "user intent"). Some people who issue the query "Barack Obama" may, for instance, be looking for biographical information, while others may be interested in a recent news story about him. But the algorithm produces a single ranking.[18] No single ranking can be perfect for both users. Fourth, if Web sites benefit from placement on a SERP and know the underlying algorithm, they can manipulate the design of their pages to improve their placement. So, in our example, a publisher that wants to appear higher on Google's results for "Barack Obama" could game the process by rewriting its content to more frequently state the President's name.

C. Google

Google started in 1997. The source of its initial success was its PageRank algorithm, which used data on external links to a page as in indicator of page quality. By incorporating that measure into its algorithm for ranking how well Web sites matched a query, Google generated results that searchers found far more useful than the results generated by AltaVista and the other general search engines available at the time.[19]

External links to a page are an indicator of (or proxy for) page quality, but they do not measure quality directly the same way that a yardstick measures length or inches of mercury measure

[18] To be sure, an algorithm might incorporate user-specific information, such as location or search history. But the fact remains that two searchers issuing the same query and that otherwise look identical to Google or any other search engine might be interested in quite different information.

[19] The potential use of links between pages was one fundamental way in which the Internet provided opportunities for information retrieval that had not been available in other applications of computerized information retrieval. Another, which Google's founders were not the first to realize, is that the volume of queries on the Internet is so great that many users issue the same query. As a result, a search engine can track user responses to a query and then use that data to modify its subsequent responses to the same query.

temperature. To be sure, there is a logical connection between links to a page and page quality, as Web page publishers tend to place links to sites they find useful. Still, the logical connection between links to a page and quality is one that is plausibly true on average, not a direct measure.

The key implication of these points is that even though a search algorithm entails sorting scores from numerical calculations on objectively observable data, the quality of search results is inherently subjective. The only "objective" basis for believing that Google's initial algorithm using PageRank was better than the alternatives available at the time would have been evidence that users preferred Google's search results. Without knowing whether users preferred the results from Google's algorithms to those from other algorithms, there was no objective way to ascertain that Google's results were better.

Notwithstanding Google's initial success, the earliest versions of Google were limited in several important respects. First, its responses to queries were limited to links to Web pages it had crawled, which are candidate "blue links."[20] The ability to crawl the Web and link the results to queries was a crucial step in making the information available on the Web useful and accessible, but links are an inherently indirect way of answering questions. When a search engine merely provides links, its role is analogous to a card catalogue in a library. It suggests where people might find the answer they are looking for, but does not provide actual answers.

Second, the information available on the Internet is not limited to information on Web pages reached by a Web crawler. As the Web has developed, a substantial amount of information is dynamically generated, which means that the publisher generates the information by accessing a data base in response to user input. This sort of information - the "hidden Web" - is not visible to Web crawlers (or at least first-generation Web crawlers - which can only access the "surface Web").[21]

Third, assuming that the earliest general search engines, including the earliest version of Google, were based on sorting scores from an algorithm that assigns a single value to each page with respect to each match, the results could not capture the diversity of possible motivations behind a search. In a single-valued algorithm, the second-ranked item is the one that would be first if the first-ranked item did not exist. In some cases, the second-ranked item might be very similar to the first item. That link may not

[20] Google gives each of its search results a blue title. When the result is a link to a Web site, the title is itself a link to the site (meaning that clicking on the blue title takes the searcher to the Web site).
[21] For discussions of the "hidden" or "deep" Web, see Bergman (2001) and Sherman and Price (2003).

be the most useful link available to someone who clicks on the second link because he was dissatisfied with the first link.

Fourth, the earliest versions of Google were best suited to evaluating textual content. As an increasing fraction of the material on the Internet became images, videos, and audio files, Google needed algorithms that were well suited to evaluating and helping its users find such content.

Finally, concerns that third-party publishers (that is, operators of Web sites that are independent of Google) can game search engine algorithms are real. Web site publishers frequently employ SEOs, or search engine optimization companies, to obtain information that can be used to tweak their properties in ways that increase their representation and improve their positions in search results. If search algorithms measured consumer utility perfectly, search engine optimization would pose no problems. Improving the score a site gets from an ideal algorithm would mean improving the quality of the Web site itself (and so the utility of those that visit the site). Precisely because the algorithms are imperfect, however, changes in a Web site's design can simultaneously improve a Web site's ranking by an algorithm and lower its quality. Such changes reduce the quality of the search engine itself, both to its users and its owner. The result is a constant cat-and-mouse game between Web sites and search engines as the former try to increase their visibility and profits by gaming the search provider's algorithms, and the latter adjust their algorithms to thwart such efforts. Indeed, Google's original insight about the value of links as an indication of quality is subject to manipulation.[22] Google devotes substantial effort to detecting sites that have artificially engineered external links so as to improve their placement in Google's search results.

D. "Vertical" Search

Roughly contemporaneously with the development of general search engines, sites that specialized in particular types of information also arose. Travelocity and Expedia, which are currently two of the top three specialized Web travel sites, launched in 1996.[23] Amazon.com, which has become the starting point for a large number of shopping searches, started in 1995, albeit in the more limited role of

[22] The term "Google bomb" refers to a situation in which people have intentionally published Web pages with links so that Google's algorithms generate an embarrassing or humorous result. For example, by creating Web pages that linked the term "miserable failure" to George W. Bush's White House biography page, people were able to "trick" Google's algorithms into returning that page as the top link to a Google query for "miserable failure."

[23] The third is Orbitz, which five of the six major airlines launched in 2001.

an on-line book retailer. MapQuest, an early internet mapping service that AOL acquired in 2000, launched in 1996. CitySearch, the first online source devoted to providing information about local merchants and locally available services, also launched in 1996.

In the late 1990's, the development of thematic search was not limited to specialty sites. Yahoo! was a leader in developing sites focused on particular types of information. It started Yahoo! News in 1995, and Yahoo! News was the most popular on-line source of news by 1997.[24] It launched Yahoo! Finance in 1996. As noted above, Microsoft started Expedia (albeit before it developed MSN, its first collection of Internet sites) in 1996.

Specialty search has one natural advantage over general search. By going to a specialty site (whether it is a stand-alone site or a thematic section within a more general site), a user reveals a great deal about what he is looking for; and that implicit knowledge simplifies the search for information that is responsive to the query. A challenge for general search engines is to ascertain the broad intent of a search, whether it be for news, an item to buy, driving directions, or a trip to plan. To the extent that a specialty site is gathering information from the Internet, it can draw from a smaller set of information than does a general site;[25] and it can tailor the algorithm for ranking how useful a site is likely to be to someone issuing a particular query to the category of the search. For example, the algorithm for a news site is likely to give greater weight to the date (placing positive values on more recent pages) than would a site focusing on images. Finally, a specialty site can design the user interface to get specific information. For example, travel sites design their pages to solicit from users their origin and destination and when they want to travel.

While some specialty sites did draw information from the Internet, they were not restricted to such information. They licensed some of it and produced some of it themselves. For example, the only practical way for a finance site to provide real time (or nearly real time) stock price data is to license it. Yahoo!, despite its origins as a site that catalogued information available on the Web, licensed stock price data for Yahoo! Finance rather than referring users to some other site where they could find it. Travel

[24] Yahoo! Press Release, "Yahoo! Ranks No. 1 in News," (March 25, 1997), available at http://pressroom.yahoo.net/pr/ycorp/173352.aspx.

[25] A specialty site that gathers information by crawling the Web can limit its crawling to sites that provide the class of information its users want. The point is not limited to Web crawlers, however. A specialty site that relies on human cataloguing of sites can limit the sites its catalogs.

sites get feeds from providers or, in some cases, commit to inventory of items like airplane seats or hotel rooms and then sell their offerings.

E. Google's Thematic Search

Google's first thematic search offering was for Images, which it started in July 2001. Google's apparent motive for introducing Google Images was to provide access to the sort of Web content not easily captured by Google's main algorithm at the time, which was focused on textual content.

Google started its news thematic search in the wake of September 11, 2001.[26] At the time, Google's general search algorithm was not designed to identify important breaking news stories. Google failed miserably for people who tried to find the news about the September 11 attacks by going to Google and entering a query for "World Trade Center" or "World Trade Center attack." Four hours after the attack, the top link for a query for "World Trade Center" was the site for the World Trade Center Association, an association of 300 world trade centers in over 100 countries. Recognizing how badly it was serving its users, Google jerry-rigged a solution by placing in a portion of the page usually reserved for advertisements the heading, "Breaking News: Attacks hit US" along with links to the *Washington Post* and CNN Web sites. As Sullivan (2011) observed, "Google was literally telling people not to try searching."

Google started developing Google News shortly after September 11, 2001. In contrast to Google's general search algorithm, search results in Google News relied on "crawls" just of news sites, and the crawls occurred every hour. Google launched the beta version of Google News in 2002.[27]

Google launched Product Search, originally called "Froogle," in 2002. In addition to using crawled results, Google gave merchants the opportunity to provide direct feeds to Google about their product listings.

Initially, the results from Google's thematic searches were primarily available to users who navigated to the relevant thematic search page before entering their query. As a result, Google, like other

[26] See Kramer (2003) for a description of the start of Google News.

[27] It did not remove the "Beta" label until 2005, but it was used widely and was well-reviewed before that. For example, it won the "Best News" Webby in 2003. The Webby's are the equivalent of Academy Awards for the Internet.

general search sites, had what one Internet commentator likened to a Swiss Army knife.[28] Like a Swiss Army knife, Google contained many different tools. To use them, however, one had to open the relevant "blade" separately.

One of the problems with the Swiss Army knife approach was that many Google users did not use the thematic tabs within Google. Instead, even when they had queries for which one of Google's thematic search results would have been most appropriate, they entered them into Google's general search bar. If one entered a shopping query into Google's general search bar, Google might return a link to a vertical search site that it had crawled, but it generally would not provide a link to the results from entering the query into the relevant Google thematic search site.

F. Universals as a "Second Generation" of General Search

In Section B, we noted several key limitations of what we characterized as "first generation general search engines." In its original incarnation and, to a large extent, until the introduction of Universals,[29] Google's results were limited to answering queries with links to external Web sites. To the extent that the algorithm is best suited to evaluate textual content, it might fail to generate relevant images, video, or audio files. An algorithm that assigns a single value to serve as the basis for ranking a Web site's potential usefulness to a search cannot inherently value diversity of results. Finally, a single algorithm for all types of searches was at an inherent disadvantage with respect to thematic search sites. Unlike a query made in a general search bar, one made on a thematic search site inherently provides a user-defined indication of the category of information being sought. (For example, a user that visits Travelocity.com has made plain that he is seeking travel information or assistance.) In principle, one might argue that Google could address the difficulty of ascertaining intent by educating Google users to start at its own thematic sites. But Google has to design itself to provide valuable results given the way people actually use Google rather than the way Google might like them to use it.

[28] See Sullivan (2001).

[29] A precursor to Universals at Google was "OneBoxes," which were links to Google thematic results that appeared at the top (or, in some cases, the bottom) of Google's SERP. The introduction of Universals provided for more flexible placement of the links to Google's thematic search sites within its SERP.

While ascertaining intent from a query perfectly is generally not possible, probabilistic inferences about intent are. Someone who issues the query "Barack Obama" might be looking for a recent news story about Barack Obama. Even though a query for Barack Obama in Google Product search does yield results, the probability that the intent behind a query for "Barack Obama" in Google general search is to purchase a product seems far more remote than the probability that the intent behind such a search is to find recent news.

As described in Section II, the Universals at issue in the FTC investigation were links to the results of Google's thematic search within its general SERP. Another and more descriptive term used to describe Universals is "blended search," as a Universal entailed blending the result from one or more different algorithms into Google's general search algorithm. Universals represent a probabilistic approach to understanding user intent. When Google's algorithms detect a significant probability that a user's intent is one for which the results from one of its thematic searches would best meet the user's needs, the link to the Universal serves as a type of follow-up question. In the query for Barack Obama, the link to the News Universal that appears asks, in effect, "Are you interested in news about Barack Obama?" Clicking on the Universal is implicitly an affirmative response while not clicking on it may be a negative response.

The introduction of Universals addressed some of the limitations inherent in the first generation of general search results. Because a Universal gives users access to a different algorithm reflecting a different set of search objectives, it provides a more diverse set of results than the results that emerge from the ranking produced by a single algorithm. Because some Google Universals focus on non-text content – *i.e.*, images and video – they enrich the type of content to which Google can point users. To the extent that Google thematic search was more likely to rely on content not generated by crawling the Web (such as the merchant-provided information in Google's Shopping Universal), they can help users find information that the first generation of general search engines could not locate. Because each of these changes – providing more diverse results reflecting different possibilities of user intent, making images and video content more accessible through a general search, and providing additional classes of content – represent solutions to such fundamental limitations of the first generation of general search engines, Google's introduction of Universals delineated a second generation of general search.

The introduction of Universals represented not only an innovation in Google's algorithms but also in how it presented results. A general search engine could use multiple algorithms and still return "ten blue links." Rather than the ten being those receiving the highest score from a single algorithm, a meta-algorithm could, for each "slot," decide which algorithm it would use, and then pick the top available link from that algorithm. Consider the search for "John Sherman" discussed in the previous section. Suppose a meta-algorithm assessed a 70% probability that a query for "John Sherman" was a search for biographical information and a 30% probability that it was a search for a photo of John Sherman. The first result would then be the top-rated site from the algorithm that would be best for yielding biographical information. One of the subsequent links – perhaps but not necessarily the second – could be a link to the one photo that received the top ranking in the "Images" algorithm.[30] That is not how Google handled the blending of results from multiple algorithms. Instead, rather than placing a single thematic search result on the SERP, Google returns a group of links, together with a link to the full set of thematic results that are deemed relevant to the query, all at the same position on the page.

Google was not unique among general search engines in developing Universal Search. Bing and Yahoo! use them as well. Indeed, many aspects of Bing search resemble Google. If one enters a query into the search bar on the Bing home page, one gets the results of Bing general search. As with Google, the top left hand corner has links to Bing thematic search pages such as "Videos," "Images," "Maps," and "News." The results of some queries into Bing's general search engine contain links to the results of entering the same query on one or more of Bing's thematic search pages, *i.e.*, Universals. Perhaps the similarity is mere imitation, but another and more compelling explanation is that Universals are an obvious approach to improving upon the limitations associated with the first generation of general search engines.

G. Further Developments

While Google's introduction of Universals like its Products and Local Universals helped it address some quite fundamental issues about its general search product, they did not address all the limitations.

[30] This is not the only feasible way to generate diversity in results. For example, using what we have called the first generation of general search algorithms, a search engine would, for each query, compute a single score for ranking and the top ten listings would be those with the top ten scores. A search could conceivably place the Web site with the top score first and then another set of scores for all remaining Web sites based on an algorithm that is contingent on features of the first listing.

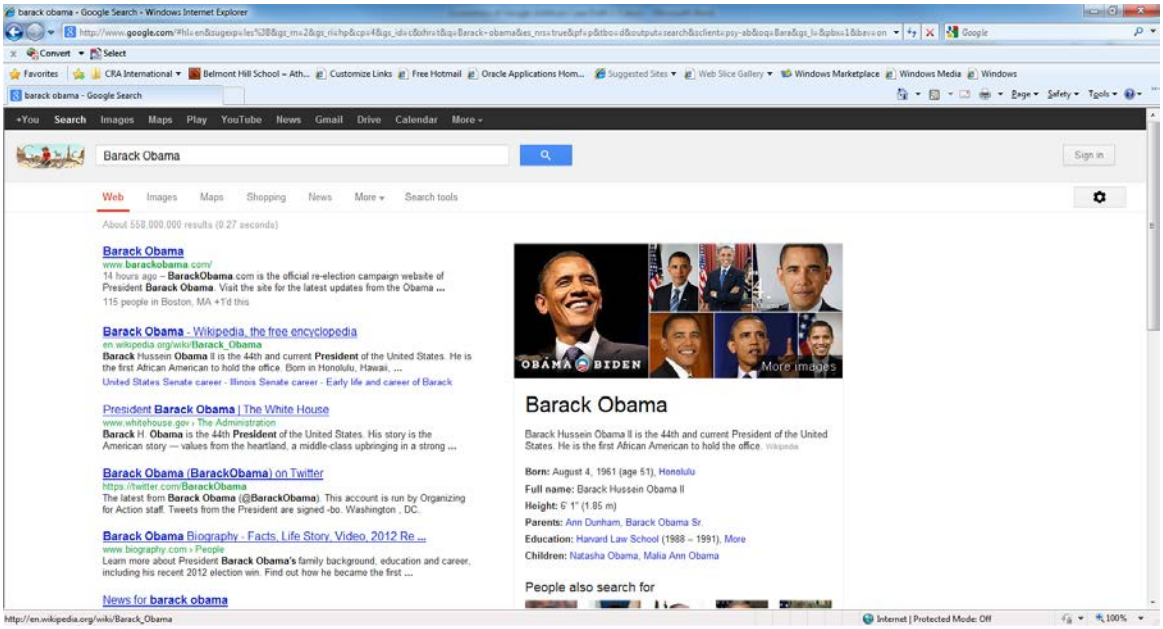
These Universals were an innovation in the underlying algorithm for identifying sites that a searcher might find useful and in how Google displayed those results. They represented an approach to combining search for different classes of Web content - text, video, and images – and, to the extent that some of Google's thematic search results relied more heavily on direct feeds from sites, they enabled Google to give users access to information beyond the results of Web crawling.[31] They did not, however, change the fact that the ultimate outcome of a Google search was a link to an external Web site. It was not directly providing users with the information they wanted.

An early example of Google directly providing an answer is the result from entering into Google the query, "What is the square root of 2?" Google returned (and still returns) the answer together with a link to Google Calculator, a program hosted by Google that generated the answer. Google has subsequently expanded the extent to which it returns answers created by Google itself rather than links to third-party sources of information. In Section II, we used a search on John Sherman to exemplify the Images Universal. We did not resort to a relatively obscure query merely to pander to an audience interested in antitrust. Figure 5 illustrates a newer and different response to a search that might be expected to return images, which resulted from the less obscure query, "Barack Obama."[32]

[31] To the extent that Google licensed some content for its thematic search results, some successful Google searches may not have ended with a referral to an external site.

[32] The information about Barack Obama on the right hand side of Figure 5 is an example of a "Knowledge Graph," which Google introduced in 2012. Google considered it a sufficiently important innovation to list it as a corporate highlight in its 2012 10-K. See Google, 2012 form 10-K, pg. 4, available at http://www.sec.gov/Archives/edgar/data/1288776/000119312513028362/d452134d10k.htm.

Figure 5



This newer type of response appears to the right of the "blue links." It includes some basic biographical information generated by Google and, above this, a set of photographs with a link to "More images," which is the Images Universal. Unlike the Images Universal returned by Google in response to our query "John Sherman" (see Figure 2), the placement of this new result was not interspersed among the external Web links.

There are many other ways in which Google now provides information directly. Examples of queries for which Google has returned direct answers to us include, "New York weather," "Who wrote *War and Peace,*" and "Who is Barack Obama's wife." Google's responses to these queries require a specific triggering mechanism. That is, the source of the response to these queries is something other than an algorithm generating the top ten Web links that respond to the query, and Google needs a meta-algorithm to determine when to use the results from these alternative sources in its SERP.

We would characterize the direct provision of answers to queries as a third "generation" of general search. In using the term "generation," we do not mean that the second generation supplanted the first and the third supplanted the second, which happens with some products. Instead, the generations we describe, like generations of people, coexist. However, also like generations of people, the second generation was necessary to produce the third.

This last point is important because there can be little doubt that answering questions directly benefits consumers. In order to respond to a query with information, a general search engine needs to identify the likely intent behind a query, ascertain a degree of confidence about the intent, and identify the relevant information from the range of information resources available to Google. The introduction of Universals, which required Google to refine its (probabilistic) assessment of the intent behind a search and then provide a link to the best available information for that intent regardless of its form, was an important intermediate step toward the ultimate goal of providing information directly.

IV. The Role of Economics in Finding a Suitable Conceptual Framework

There is a consensus in the United States and other jurisdictions that antitrust enforcement should be based on economically sound analyses of firm conduct, and that the involvement of economists both within the antitrust agencies and in court proceedings contributes to that objective. This does not mean that it is always clear from the outset which types of economic analysis would be of the most value in particular cases. Economics does have a relatively well-established role in some types of cases. In a predatory pricing case, for example, economic analysis can help identify the "relevant notion of cost" and then assess empirically whether the defendant charged prices below the relevant notion of cost. The role of economics is partially conceptual, as the "relevant notion of cost" is an economic (as opposed, say, to an accounting) concept, and partially empirical. In merger cases, market definition is virtually always a key issue.[33] Again, the role for economics is partially conceptual, as economic analysis has led to refinements of what constitutes a relevant market for antitrust markets, and partially empirical in applying those concepts to the case at hand.

The antitrust investigation into Google was one where the precise form of the economic analysis that was needed was less obvious. This was in part the case because online search is very different from the sorts of markets that are more typically analyzed under the antitrust laws – one-sided markets in

[33] The trend toward an integrated analysis of merger effects and market definition discussed in the DOJ/FTC 2006 Horizontal Merger Commentaries and embodied in the revised 2010 DOJ/FTC Horizontal Merger Guidelines does not alter this point. The integrated approach evolved from economic analysis of what constitutes a relevant antitrust market.

which the concern is higher prices and reduced output. Market definition would have been an important issue had the case gone to court, but neither a SSNIP test nor the sorts of empirical demonstrations of effects that the FTC used in *FTC v. Staples* would have been helpful in delineating the relevant markets. One reason for this is that search advertising is free to users, and no theory of the Google case of which we were aware suggested that this would change, meaning that a percentage SSNIP test or *Staples*-like pricing evidence would lack mathematical meaning, empirical basis, and conceptual relevance. Nor were there criteria such as the *Brooke Group* test that could be used to ascertain whether Google had crossed a line beyond anticompetitive effects could be said to be likely, again, in part, because pricing of search was a non-issue.[34] Indeed, the lack of a pre-existing test – and the novel nature of online search – meant that a necessary step in the analysis was to first identify conceptually what would constitute an antitrust violation on Google's part. Only then would it be possible to develop and implement a test.

In this section, we put forward two competing frameworks for assessing the allegations against Google. The first approach is to start with a model of Google and then draw antitrust implications. The second is to start by trying to model the alleged antitrust offense (*i.e.*, leveraging) and then assess how the model matches Google's business and the markets in which it operates. We argue that both approaches lead to the conclusion that any case against Google suffered from fundamental conceptual flaws. The final subsection of this section on conceptual issues in the case takes up standards for assessing unilateral conduct under the antitrust laws and presents an interpretation of what would constitute an antitrust violation within the context of the model we present in the first subsection.

[34] In Brooke Group Ltd. v. Brown & Williamson Tobacco Corp. (509 U.S. 209 (1993)), the Supreme Court held that for a plaintiff to recover in the context of a Robinson-Patman predatory pricing claim, it "must prove (1) that the prices complained of are below an appropriate measure of its rival's costs and (2) that the competitor had a reasonable prospect of recouping its investment in below cost prices." Ibid. at p. 210. It is worth noting that the Court's opinion was based on economic reasoning, and reiterated the need for careful economic analysis before antitrust harm could be found to have occurred. As Justice Kennedy wrote, "[w]ithout recoupment, even if predatory pricing causes the target painful losses, it produces lower aggregate prices in the market, and consumer welfare is enhanced. … If so, then there is the further question whether the below cost pricing would likely injure competition in the relevant market. The plaintiff must demonstrate that there is a likelihood that the scheme alleged would cause a rise in prices above a competitive level sufficient to compensate for the amounts expended on the predation, including the time value of the money invested in it. … Evidence of below cost pricing is not alone sufficient to permit an inference of probable recoupment and injury to competition. The determination requires an estimate of the alleged predation's cost and a close analysis of both the scheme alleged and the relevant market's structure and conditions. Although not easy to establish, these prerequisites are essential components of real market injury." Ibid.

A. The Economics of Google Search

Modeling Google begins with a few simple observations. Google generates revenue by selling online advertising. To do so, it must attract an audience for its advertisers. Google's approach to doing so is to offer consumers something of value that encourages them to allow themselves to be exposed to online advertising. Google accomplishes this by providing users with the ability to obtain search results in response to their queries, at no charge, and by placing online advertisements on the same search results pages that display the answers to the users' queries. Because Google is not the only way for consumers to obtain answers to their questions – and because users face virtually no costs of switching to other Web sites that they expect to provide more useful results – Google must strive to provide search results that users find more helpful than the available alternatives. Google invests a substantial amount of money on product development to improve and develop its search engine in its efforts to attract and retain users.[35]

Google search is advertising-supported, which implies that Google has a two-sided business model. That is, it has two distinct sets of customers – searchers and advertisers – and its ability to attract one group (the advertisers) depends on its success in attracting the other.[36] As a purely conceptual matter, Internet search need not be a two-sided business.[37] If Google and other search engines such as Bing were available only on a subscription basis (and did not sell advertising), they would be one-sided businesses. Internet search engines are not unique in having two-sided business models when one-sided models are conceivable. Broadcast television stations have two-sided business models for the display of video programming, while subscription cable channels like HBO, which also display video programming, operate on a one-sided model.[38] The term "two-sided business" is related to but not

[35] Google reported R&D expense of $12.8 billion in 2010, $13.6 billion in 2011, and $13.5 billion in 2012, representing 20%, 205, and 18% of its total costs. See Google, 2012 Form 10K, available at http://www.sec.gov/Archives/edgar/data/1288776/000119312513028362/d452134d10k.htm, last accessed May 28, 2013.

[36] Google's success in attracting searchers might depend on its success in attracting advertisers if part of the benefit Google users get from Google comes from the advertisements.

[37] One of the first Internet search engines, Infoseek, sought to charge for search. While its attempt at a one-sided business model failed commercially, the example illustrates conceptually what a one-sided business model would be for an Internet search engine.

[38] Movie theaters do now show paid advertisements. If advertising remains a small fraction of their revenue, then viewing them as operating primarily on a one-sided business model remains a reasonable approximation.

identical to the term "two-sided market."[39] This latter term has been more prevalent in economics, although it is often misused. Two-sided businesses often compete on one or both sides of their business against different kinds of businesses that operate on a one-sided model. DVD's and subscription internet video streaming services compete for viewers with broadcast television, so broadcast stations and networks are not in a two-sided market despite having two-sided business models.

A satisfactory model of Google would capture that its advertising revenues are a function of the number of Google searchers, and also that the number of Google searchers is a function of the quality of Google search relative to the alternatives. Such a model should also take other factors into consideration. Since a consumer cannot ascertain the actual quality of Google results for a particular search without actually conducting the search, his decision to use Google for a particular search reflects expectations about the quality of Google search. Google competes by improving the quality of its search and thereby enhancing its reputation with users. It must decide how much to spend on search engine development. In addition, as a two-sided business, it might make trade-offs between increasing searcher utility and attracting advertisers (holding the number of users constant).

In modeling Google, a major decision is whether it is appropriate to model the number of users and the relationship between the number of users and advertising on an aggregate basis or, alternatively, whether it is necessary to take explicit account of different classes of searches. While data availability might dictate the answer if one were to implement the model empirically, it is still worth considering whether, given available data, the distinctions among classes of searches is important enough to justify complicating the model or whether those distinctions are inessential details.

Absent data, the answer must be a judgment call. In our opinion, distinguishing among the classes of search is key to a proper understanding of the economics of Google. While Google is a *general* search engine, each search has a *specific* purpose; and the choice of whether to use Google for that search depends on the alternatives that are available to the user for that specific type of search. If you want a forecast for the weather in New York tomorrow, one option is to navigate to Google and enter a query for "New York weather." An alternative is to go to weather.com and enter a query for New York City. For that particular search, going to ESPN.com would be an unlikely choice. If you wanted to know

[39] As Evans and Schmalensee (2007) observe, "Two-sided platforms often compete with ordinary (single-sided) firms and sometimes compete on one side with two-sided platforms that serve a different second side."

the score of the score of a recent sporting event, ESPN.com would be a plausible alternative to Google while weather.com would not. For both of these cases (and many others), Google has innovated to provide better results for those specific types of inquiries,[40] and its success in each depends on the quality of Google's results relative to the quality of the results available from the realistic alternatives for that type of search.

Again, putting data availability aside, it is interesting to consider whether one would in principle seek to model the number of Google users on a search-by-search basis on the grounds that each search is unique. This is not a purely philosophical question. The purpose of modeling is to understand the decisions Google makes. If Google designed its search algorithm to handle individual queries, then it would in principle be appropriate to model those decisions on a search-by-search basis. On the other hand, if Google's innovative efforts were targeted exclusively at improving some over-all level of search quality, then taking account of different classes of search might unnecessarily clutter the model. The justification for modeling Google search on a class-by-class basis would be evidence that Google makes changes to its algorithms that are focused on particular classes of searches. The overwhelming evidence[41] in support of modeling Google innovation on a class-by-class basis are the Google features that are clearly designed for specific types of searches.[42]

To formalize these arguments into an economic model, one must first decide whether to frame the analysis as static or dynamic in nature. In a static setting, one could model Google as maximizing profits period-by-period. If, however, users form their expectations about the quality of Google results for a search they are considering on their previous experience, Google's choice problem must take account of this. This implies that Google's optimization problem is inherently dynamic. To take account of the dynamic nature of Google's decisions, we need to model it as maximizing its market value (which in turn reflects longer-term expectations) rather than single-period profits. Let A_t denote Google's advertising revenue, R_t be Google's R&D expenditures, V_t be Google's market value at time *t,* and δ be the firm's

[40] To see this point with respect to sports scores, go to Google and enter a query for two professional sports teams that play each while they are "in season." (For example, enter "Celtics Bulls" during basketball season or "Yankees Red Sox" during baseball season.)

[41] One would also expect internal documents to provide supporting evidence.

[42] Some Google innovations are aimed at improving general search quality. An example is spelling corrections.

discount rate *(0 < δ < 1)*. Assume for the sake of simplicity that Google incurs no other variable costs with respect to the advertising it sells.[43] Then we may state Google's objective, as of any period *t*, to be

$$maximize\ V_t = \sum_{j=0}^{\infty}\left(A_{t+j} - R_{t+j}\right)\delta^j, \quad (1)$$

where Google's advertising revenues are given by

$$A_t = \sum_{i=1}^{N} a_{ti}(C_t)S_{ti}(B_{ti}, B_t, \overline{\boldsymbol{B_{ti}}}), \quad (2)$$

in which a_{ti} is Google's advertising revenue at time *t* per search of class *i*, $i \in [1, N]$, *N* is the number of classes of search; C_t denotes the weight given by Google to consumer utility relative to advertising revenues in design decisions at time *t;* S_{ti} is the number of type *i* searches on Google at time *t;* B_{ti} measures Google's reputation at time *t* for searches of class *i,* B_t is Google's general reputation for search quality at time *t*, and $\overline{\boldsymbol{B_{ti}}}$ is the vector of reputations of Google's competitors for searches of class *i* at time *t.*

The variable C_t captures the way the model treats the two-sided nature of Google's business. If C_t = 1, then Google makes design decisions[44] entirely with respect to their effect on searcher utility and without regard to the implications for the advertising revenue per search. If C_t = 0, then design decisions are made to maximize advertising revenue per search in the near term.[45] Intermediate values reflect how Google makes trade-offs between the two sides of its business. Note that even though the natural range

[43] If Google faced other (besides R&D) fixed costs F_{t+j} in each period, the present value of its anticipated profit stream in future periods, as evaluated in period *t*, would instead be $V_t = \sum_{j=0}^{\infty}\left(A_{t+j} - R_{t+j} - F_{t+j}\right)\delta^j$. As F_{t+j} is neither a control variable nor variant with respect to any of Google's control variables, its presence would not alter the solution to this optimization problem.

[44] While our focus here is on the design of Google's search algorithms, it should be noted that the design decisions that influence Google's revenues from advertising also depend on the design of the auctions that Google employs to sell keywords (and so search ads). An analysis of these auctions and Google's associated algorithms is beyond the scope of this paper.

[45] The long-vs.-near term distinction is crucial. In the *long term* (and all else held constant), Google's advertising revenues can be expected to increase in searcher utility, as higher searcher utility increases the likelihood that Google users will return to Google's search in the future. This would imply that higher searcher utility today would generate more Google advertising tomorrow (as it would be able to expose ads to more users than otherwise). In the *near term*, however, Google might actually be able to increase its advertising revenues by *reducing* the quality of its search results. One reason for this is that the free search results that Google offers, when they are highly relevant, can act as substitutes for advertisements. For example, highly relevant search results for the term "digital camera" may include links to the Web sites of online retailers of photographic equipment. Major retailers may recognize that a highly relevant Google search algorithm may therefore reduce their need to bid for advertisements that in many cases would duplicate Google's "free" results. Knowing this, a Google that (contrary to fact) intended only to maximize near-term revenues might rationally choose to degrade the relevance of its search results, by omitting retailers from its search results

to consider for C_t is from 0 to 1, values outside that range have an economic interpretation. A value below 0 would mean that searcher utility would actually have a negative weight in Google's decisions. Similarly, since the weight given to advertising revenue is $1 - C_t$, $C_t > 1$ would imply that increasing advertising revenues has a negative weight.[46]

The feature of the model designed to capture the market environment in which Google makes decisions is the assumption that the quantity of Google searches of a given type is a function of Google's reputation for searches of that type as well as a vector of reputations of competing sites. The vectors are specific to each class of search because the competitors vary by class of search. For shopping searches, for example, the utility consumers get from Amazon.com for shopping searches would have to be an element in the vector if starting a shopping search at Amazon.com is an important alternative to starting a shopping search at Google. For travel searches, the utility users get from starting a travel search at Travelocity would have to be an element of the vector if Travelocity is an important alternative to Google as a starting point for the search.[47] For the model to capture the economics of the market, it must include the most important alternatives for each type of search. For all or virtually all classes of search, the utility users get from Bing and from other general search engines should be elements of the vector. But sites other than general search engines that are important alternatives for a particular class of search should also be included. The elements of the vector cannot be limited to the utility users get from general search engines. The fact that Amazon is not a sensible place to start a travel search does not prevent it from being a competitive constraint on Google in attracting people doing product searches, so any model that excludes it on those grounds misses an essential piece of the economics of the market.[48] Also, as people

[46] In our formulation, the average revenue per search of class *i* in period *t* depends only on Google's choice as to whether to place greater focus on advertising revenues or user utility when framing its search algorithms. While the average revenue per search in this specification therefore does depend on Google's degree of customer focus, it does not depend on the quantity of searches (overall or by class of search) in that period. The implicit assumption is that the advertising side of the business is competitive. As a technical matter, it would be trivial to incorporate a downward-sloping demand curve for Google advertising into the model if there were any evidence of a price-quantity trade-off playing any role in Google's decisions.

[47] As a technical matter, there is nothing wrong with including the utility users get from Amazon.com for travel searches as an element in the travel search vector or the utility users get from Travelocity for shopping searches in the shopping search vector. Naturally, however, the benefits users get from such searches will be low, because Amazon is (at least as of this writing) not focused on providing travel information, while Travelocity is not in the business of selling or describing products (other than travel-related services).

[48] This is similar to the point that to capture the economics of broadcast television station, one must take account of the most important products competing for viewers, not just other broadcast stations.

increasingly turn to social media such as Facebook as sources of certain types of information, then those sites must be included as competitors.[49]

Completing the model requires a link between Google's decisions and its reputation. The key decisions Google must make are its expenditures on R&D for each class of search and the degree of customer focus. Let R_{ti} be Google's R&D expenditures at time *t* aimed specifically at improving Google's search of type *i*, and let R_{t0} be Google's R&D expenditures at time *t* aimed at improving Google's search in general. Let Google's reputation at time *t* for searches of class *i* be determined by

$$B_{ti} = f\left(T_{t-1,i}, C_{t-1}\right), \tag{3}$$

where Google's stock of technology specific to searches of type *i* as of period *t*, or $T_{t,i}$, is governed by the equation of motion:

$$T_{t,i} = T_{t-1,i} + g(R_{ti}, R_{t0}). \tag{4}$$

Our model is dynamic because of equations (3) and (4), which require that Google's reputations for its various types of search as of time *t* is a function of its levels of technology and customer focus at the earlier time *t* -1. Finally, let:

$$B_t = H(B_{t1}, \ldots, B_{tN}) \tag{5}$$

Equation (5) captures the assumption that Google's overall reputation depends on its reputation for specific searches. In combination with equation (2), it provides a mechanism through which a user's decision about using Google for a particular type of search can depend on his experience with other Google searches.

The dynamic programming problem implied by this set of assumptions is that Google chooses, over all *t*, the values of C_t and each R_{ti} *(i* = 0,*1 , 2, … , N)* to:[50]

$$\begin{gathered} \textit{maximize } V_t = \sum_{j=0}^{\infty}\left\{\sum_{i=1}^{N}\left[a_{ti}(C_t)S_{ti}\left(B_{ti}, B_{t,\overline{\boldsymbol{B_{ti}}}}\right)\right] - R_{t+j}\right\}\delta^j \\ \text{subject to: } B_{t+1,i} = f\left(T_{t-1,i} + g(R_{ti}, R_{t0}), C_t\right). \end{gathered} \tag{6}$$

Of particular interest is the Bellman equation for the optimal value of C_t:

[49] An example would be a visitor to New York who posts on his Facebook Wall, "Can anyone recommend an inexpensive restaurant in the theater district?" If a significant number of users consider this to be an alternative to going to Google and entering a query for "inexpensive New York theater district restaurants," then Facebook is a competitive constraint on Google for this class of queries.

[50] Note that the only dynamic effects explicitly in the model concern Google's reputation with searchers. The model does not allow for dynamic effects with respect to advertising

$$\frac{\partial V_t}{\partial C_t} = \sum_{i=1}^{N}\left[\frac{da_{ti}(C_t)}{dC_t} S_{ti}(B_{ti}, B_{t,}\overline{\boldsymbol{B_{ti}}}\ )\right] + \delta \sum_{i=1}^{N} \frac{dV_{t+1}}{dB_{t+1,i}} \frac{\partial B_{t+1,i}}{\partial C_t} = 0. \quad (7)$$

The first term in equation (7) reflects the effect of the time *t* degree of consumer focus on current advertising revenues.[51] It is negative for $C_t > 0$ for reasons given earlier. The second term reflects the effect of the weight Google gives to consumer satisfaction on its reputation going forward and therefore its market value. Because $C_t = 1$ means Google makes search design decisions to maximize consumer utility and so its future reputation, B_{t+1}, the second term equals 0 at $C_t = 1$.

Google has a stated policy of designing its organic search results without regard to their effect on advertising revenue, and it does not allow payment to affect the unpaid, "organic" ranking of a web result.[52] Within Google, the policy is referred to as the "separation of church and state." In the context of the model, the stated policy is that $C_t = 1$. Equation (6) implies that as a purely theoretical matter, $C_t = 1$ cannot be optimal. Without measuring the magnitudes of the two offsetting effects, however, we cannot know how far the optimal value of C_t would be from unity. Indeed, the more competitive the market environment, the more likely it is that the long run negative effects from sacrificing searcher satisfaction swamp the short run gains from attempting to boost current advertising revenues. If they do, then the optimal value of C_t might be quite close to 1 and, given the practical impossibility of optimizing in a large organization, the stated policy of separating "church and state" might be optimal as a matter of practical business policy.

In evaluating the antitrust implications of whether Google takes account of implications for advertising revenues in its search design, there are three possibilities to consider. One is that the separation of church and state is optimal (given organizational realities) and that is Google's policy. That certainly could not be anticompetitive in any sense consistent with the modern application of antitrust, as the espoused goal of antitrust is to maximize consumer welfare. A second possibility is that $C_t < 1$ is optimal, and that Google follows the optimal policy (meaning that it does make some sacrifice of searcher utility to increase near-term advertising revenues). That would not be an antitrust violation either, as it would simply imply that Google is making unilateral, profit-maximizing decisions while taking account of

[51] The total derivative $dV_{t+1}/dB_{t+1,i}$ captures both the direct effect of a change in $B_{t+1,i}$ on V_{t+1}, holding B_t constant and the indirect effect of $\partial V_{t+1}/\partial B_{t+1} \cdot \partial B_{t+1}/\partial B_{t+1,i}$.

[52] See "Ten things we know to be true," available at http://www.google.com/intl/en/about/company/philosophy/, last accessed May 28, 2013.

its two-sided business model (and not factoring in any effort to anticompetitively foreclose rivals). A third possibility is that Google's policy is $C_t = 1$ even though $C_t < 1$ is value-maximizing. If so, Google shareholders might wish that Google management would make other decisions, but shareholder protection is not an objective of antitrust enforcement.[53]

We close this section with two additional points that are central to the value of economic analysis in antitrust analysis. The intent behind this model is to capture the economics of Google independent of antitrust allegations of Google. There can be little controversy that an essential feature – indeed *the* essential feature - of the "economics of Google" is that Google needs to compete to attract searchers so that it can successfully compete to sell advertising. That is why the customers in the model are searchers and advertisers. The web sites that would like to appear in Google's search results are not customers in the model because Google seeks users, not Web sites.[54] As a matter of economics, Google search is a two-sided business, not a three-sided business.[55]

The mere fact that Google design decisions have implications for the profits of these sites does not imply that they should enter the model at all. From Google's perspective as a private business firm, any effects of its technological or business-focus decisions on the profits of other Web sites are externalities. They are properly not a factor in Google's economic decision-making, and no firm is obliged under the antitrust laws to consider the external effects of their actions on competitors. Such a requirement to consider purely external effects on competitors would indeed be perverse, as competition itself necessarily imposes negative externalities on competitors (in the form of reduced profits and the lower prices that benefit consumers).

The second point concerns market definition and the relationship between economic market definition and market definition for antitrust purposes. For the purposes of understanding the economics of a firm, economic market definition must include all other firms that provide a significant competitive constraint. Antitrust markets can, however, be narrower than economic markets if a subset of firms within

[53] This set of possibilities is not exhaustive. The key point is that there are (at least) three distinct types of behavior that would qualify as being competitive.

[54] A site can deny Google the right to crawl it and thereby exclude itself from Google results. But the issue in the case concerns sites that want more frequent and more prominent display in Google, so denying access to Google is not an issue.

[55] Google has other businesses, but they were not at issue in the FTC investigation into Google search.

a market could accomplish anticompetitive effects without the cooperation of some of the other firms in the economic market. The development of the SSNIP test for merger analysis has clarified this point with respect to understanding price effects of mergers

But nothing comparable to a SSNIP test exists for defining the relevant markets to assess the antitrust allegations against Google. As a result, there is no alternative to economic market definition as a basis for defining antitrust markets. In our economic model of Google, the market enters through the vectors of reputations of competing Web sites. As a matter of economics, those vectors need to include every site that imposes a significant competitive constraint on Google whether or not they are also general search engines.

B. Leveraging

The allegations of Google bias amounted to leveraging claims; and, while one effect of an increased role for economics in antitrust enforcement is to cast doubt on a substantial fraction of leveraging allegations, the post-Chicago literature on a variety of vertical issues has stressed that some leveraging claims might be economically sound. Thus, one might ask whether it is possible to construct an economic model to make sense of the allegation that Google uses its Universals to extend its market power from one market into an adjacent market. In this section, we argue that if one tries to formalize leveraging claims, one ultimately confronts the same issues addressed in Section IV and concludes that they make no economic sense.

Implicit in any leveraging claim is that there are two (or more) distinct stages of "production." If one hypothesizes a two-stage product that is relevant for assessing the claims against Google, the second stage is a vertical search site that directs a user to one or more Web sites where he can find the information he wants. The first stage is a Google search that provides a link to the vertical Web site.

There are searches in which a user navigates to Google, enters a query, gets a link to a vertical search site as one of the responses, and clicks on that link. If the user is satisfied with the outcome, then Google generally benefits and is likely to get the user to return for subsequent searches. Thus, the sequence captured by the model (or, more accurately, the starting point of the model) is a possible outcome to a Google search.

The economic analysis of leveraging does not end with that observation, however. A representation of a product in the market is not a complete economic analysis. Rather, economic analysis requires that the product be placed in a market setting. Doing so requires specifying market demand and then identifying the competition to supply that demand.

In leveraging models, there is typically some overall demand for a product that necessarily has two stages of production. For example, if one were concerned about leveraging market power in Portland cement into the ready-mix concrete market, the model would assume an underlying demand for concrete. The implicit assumption is that concrete is a relevant economic market. Leveraging models require that there is only one (or possibly a small number) of suppliers for at least one of the stages. The traditional concern with respect to concrete is that the Portland cement market within a relevant geographic area is highly concentrated.

To try to apply the leveraging model to the allegations against Google, one needs to ask the same sorts of questions asked with respect to the model of the economics of Google in subsection A above, and it is in answering these questions that the leveraging model breaks down. Whatever value the two-stage product provides to the users of Google or other general search engines, that "product" does not even represent Google's entire response to a query. Not all of Google's responses to a query are to sites that provide for and require an additional but more focused search. Some (and, often, most) are to sites that might provide the relevant information without an additional search.

As in modeling the economics of Google, modeling the leveraging allegations requires asking whether the alternatives are the same for all searches or, alternatively, whether they vary by class of search. The answer to that question has to be the same whether one is modeling the economics of Google or the leveraging allegations. As we argued above, the alternatives do vary by class of search; and, for all or at least nearly all searches, many alternatives exist. The alternatives do include other general search engines that can be the starting point for this two-step sequence,[56] but there are others. The competition for, say, shopping searches that start on Google and get passed off to a shopping site is not limited to shopping searches that start on general search engines and then get passed off to a vertical search site. The same vertical search sites that might appear in Google's SERP compete as the starting

[56] One possible dimension of competition between general search engines is to do a better job identifying useful vertical search sites.

point for searches. Some of the allegations against Google would have it that Google is the "on-ramp" to the Internet. The analogy to a highway suggests that the access points are inherently limited. But, for example, Hotels.com or Monster.com would presumably not invest in expensive television advertising campaigns if they did not think it was possible to get people to navigate to them directly; and it makes no sense to suggest that it no one starts shopping searches at Amazon.com or BestBuy.com. Also, an increasing amount of search – particularly certain types of thematic search - are on smart phones or tablets. Compared with searches on desktops, those searches are more likely to start on apps and avoid altogether the intermediation of a general search engine.

While the assumption is rarely stated explicitly, models of leveraging market power from one stage of production to another implicitly assume that the output of the two-stage process represents a relevant antitrust market. Once one recognizes, however, that the product generated by the two-stage process competes within a broader set of product offerings then, as a matter of economics, even a monopoly at one stage (which, in any event, Google does not have) would not confer market power to the same firm's operations in the second stage.[57] And without the requisite market power, the leveraging claim makes no sense.

In Section II, we likened the meaning of the word "general" in the term "general search engine" to its use in the term "general store." We are not aware of antitrust cases related to "general stores," but the question of whether department stores constitute a relevant market closely parallels the question of whether general search engines do. Department stores sell a variety of goods. The precise mix varies across department stores, but a single department store might sell men's clothes, women's clothes, jewelry, housewares, and furniture among other items. All the types of items they sell are available at stores that specialize in those items. If Macy's offerings of men's clothing are not competitive with the offerings at men's clothing stores, it cannot expect to sell much men's clothing; and the failure of men's

[57] As a general principle of economics, this point requires some clarification. Using the hypothetical monopolist approach to market definition, suppose the boundaries of a relevant antitrust market consist of two products, A and B. Since A by itself does not constitute a relevant market, even gaining a monopoly over A would not confer the market power to impose a "small but significant non-transitory increase in price" or "SSNIP." Yet, a monopoly over a component to A might confer the power to impose a SSNIP because a 5% increase in just one component would have cause the price of A to increase by less than 5%. Thus, while it is theoretically possible to have market power over an input to a product that does not itself constitute a relevant antitrust market, the point remains that assessing any market power over the input into A must take account of the competition to A provided by B.

clothing stores to offer housewares does not prevent them from competing against Macy's to sell men's clothing. As with general search engines, the portfolio of offerings at a department store is what, in the technology world, would be called a *feature*. Some people might find the generality to be a desirable feature perhaps because the consistency of a department store's choices with respect to price, quality, and taste across product classes reduces search costs and avoids the need to identify specialty outlets in each product class that match their tastes. Others might find the generality to be undesirable, perhaps because they find it difficult to locate what they want in a large store. But the feature does not define an antitrust market.[58]

A cynical view of the role of economics in antitrust enforcement is that a clever economist can come up with a model to justify any position. We believe that this perception reflects sloppy economics rather than economics done correctly. The casual observation that Google was leveraging market power from one market to another seems on the surface to provide an economic foundation for the complaints against Google. When one uses economics properly to address such assertions critically, however, economics reveals conceptual flaws in the allegations.

C. Antitrust Standards for Allegations of Anticompetitive Product Innovation

Taken together, the arguments in subsections A and B suggest that the allegations against Google suffered from serious conceptual flaws. The starting point of the allegations seems to be that Google has at least to date been by far the most successful general search engine. No matter what perspective one uses as a starting point for formulating an economically sound objective, one has to ask the question of what alternatives users have to Google. The answer to that question varies by type of query, and once one starts considering the different classes of queries, it becomes clear that there are

[58] Had the FTC brought a case alleging leveraging, another fundamental issue it would have had to confront is whether Google general search and its Universals are separate products. While we believe that they are not, the economic analysis of product definition is not nearly as well developed as the economics of market definition. As George Stigler observed in the introduction to, "The Division of Labor is Limited by the Extent of the Market," "Economists have long labored with the rate of operation of firm and industry, but they have generally treated as (technological?) datum the problem of what the firm does – what governs the range of activities or functions." Economic analysis of when products are separate would potentially provide valuable input into legal doctrine.

many alternatives to Google. Google success as a general search engine does not make it dominant in any well-specified antitrust market.

The FTC inquiry took nineteen months and the review of a massive body of evidence. If economic theory reveals fundamental flaws in the allegations, one might ask why such an extensive inquiry was necessary. While the theory we describe suggests that the hurdles for demonstrating a valid case were high, it would overstate matters to suggest that there is nothing that the FTC could conceivably have found that would have justified bringing a case. Indeed, the model in Section IV-(A) provides at least a starting point for what evidence would be necessary.

Rational legal standards necessarily reflect the insights of decision theory. This is well established as a matter of law generally and of antitrust law in particular. The presumption of innocence in criminal trials is not because it necessarily leads to the correct outcome but because of a judgment about the relative costs of convicting an innocent person and of letting a guilty person escape punishment. An example from antitrust law is *Brooke Group*,[59] in which the Supreme Court explicitly considered the possibility that pricing above cost could constitute predation, but declined to make it illegal for fear of chilling the very sort of competitive behavior the antitrust laws are designed to promote.

There has been substantial debate in the antitrust community about appropriate standards for unilateral conduct. Candidate standards are a "balancing test," a "profit-sacrifice test," a "disproportionate harm" test, and a "no economic sense test."

The "profit-sacrifice" test is the one proposed by Ordover and Willig (1981) in their highly-cited article on an economic definition of predation.[60] Their article covered both predatory pricing and predatory innovation. With respect to both, their argument was that predation is behavior that deviates from behavior that would be profit-maximizing absent any benefit from excluding a rival. According to their definition, cutting price in response to entry would not necessarily be predatory pricing because doing so might be a rational (*i.e*., profit-maximizing) short run response to a changed market conditions. Pricing below short-run marginal cost or average variable cost would meet their definition, but so could above-cost pricing that was below the profit-maximizing level.

[59] Brooke Group Ltd v. Brown & Williamson Tobacco, 509 U.S. 209 (1993)
[60] Janusz A. Ordover and Robert D. Willig, "An Economic Definition of Predation: Pricing and Product Innovation," Yale Law Journal, Vol. 91, No. 1 (Nov., 1981), pp. 8-53.

In a world of perfect information, the Ordover-Willig standard makes sense as an economic definition of predation. However, given that information is necessarily imperfect, trying to implement the Ordover-Willig standard would create the risk of over-estimating the short-run profit-maximizing price and thereby labeling a competitive price-cut as predatory. This concern justifies the *Brooke Group* standard, which is an example of a no economic sense test.[61]

There are two reasons why the standards for judging innovation to be predatory should reflect at least as much caution about a false conviction than the standards for predatory pricing. First, the benefits from product innovation can far exceed the benefits from price competition, so a standard that might label innovation as anticompetitive can do even more damage than a standard that labels a competitive price cut as illegal. Second, there are objective (or nearly objective) benchmarks for pricing under competition which can serve as the basis for a predatory pricing standard and which can provide guidance to firms as to what behavior is and is not legal. No such standards exist for innovation.

Whether or not it would be feasible to implement the model empirically, the model in Section IV provides a basis for comparing the different conceptual standards for labeling Google's innovative efforts as anticompetitive. Recall that the model contains a parameter, C_t, that reflects the trade-off between searcher utility and current advertising revenues, with $C_t = 1$ indicating that Google maximizes searcher utility and $C_t = 0$ meaning that Google maximizes advertising revenue per search. We argued that, in principle, the profit-maximizing value of C_t would fall between the extremes (although there is no ex ante basis for knowing how far the theoretical optimum is from the extremes). In principle, any value of C_t different from the optimal value would constitute a profit sacrifice. It is not clear why choosing C_t below the optimal value would be exclusionary. But a value for C_t above the optimal value could be as it would prevent competitors from attracting searchers in the future. Such behavior would be analogous to charging a price below the short-run profit-maximizing level.

As a matter of economics, providing search that makes searchers better off than they otherwise would be is not by itself anticompetitive. "Anticompetitive" is not a synonym for "profit-maximizing" or

[61] One might argue that the Ordover-Willig profit-sacrifice standard is a no-economic sense test since it makes no economic sense to sacrifice profits except to excluded rivals. But there is a key difference. The Ordover-Willig standard captures behavior that quantitatively makes no economic sense without an exclusionary motive. The *Brooke Group* standard is behavior that qualitatively makes no economic sense absent an exclusionary motive.

"efficient." We doubt that any court would consider it inherently anticompetitive for Google to make its search "too good" for users without inquiring whether there is a dangerous probability of driving rivals from the market and recouping the foregone profits when they do.

If, however, one could estimate the parameters of our model, there is a possible result that we would characterize as anticompetitive. As we argued in Section IV, the natural range for C_t is between 0 and 1, but values outside that range nonetheless have an economic interpretation. A value of $C_t > 1$ would mean that Google made design decisions that were harmful from the standpoint of both sides of its business. This would be behavior that qualitatively makes no economic sense and could be at least one component of what it would mean (at least conceptually) for Google's decisions on innovation to be anticompetitve.[62]

Even if one had evidence – either econometric or informal – that $C_t > 1$ for some time periods, decision theory might suggest that the legal standard require additional showings of a dangerous probability of success. In *Brooke Group*, there was substantial evidence of anticompetitive intent, but the Court did not consider such evidence to be sufficient.

Finally, we note that the FTC was reportedly considering whether Google's behavior violated Section 5 of the FTC Act, which bans "unfair methods of competition," rather than Section 2 of the Sherman Act, which makes it illegal to monopolize or attempt to monopolize a market. This reflects a view that has been put forward by some FTC commissioners that the standards for evaluating unilateral conduct under Section 5 are less stringent than those for Section 2. While the lower penalties for violating Section 5 relative to section 2 may reduce the cost of a false conviction somewhat, that effect is at most minor relative to the potential harm to consumers from making companies reluctant to engage in innovation that might subsequently be judged illegal. We do not view the proposed use of Section 5 rather than Section 2 as altering the basic economics of assessing the allegations.

[62] Again, it would likely be appropriate to have a dangerous probability of success in excluding one or more rivals and the plauisibility of recoupment as additional prongs to the test.

V. Assessing the Bias Allegations against Google Empirically

From the FTC's closing statement, it appears that much of its empirical investigation concerned whether Google's decisions about triggering and placing its Universals were "biased." In this section, we assess what such an investigation would entail. In assessing the bias allegations, it is useful to distinguish between specific allegations and what might be termed general bias. The specific allegations included explicit demotion of competing Web sites in Google's algorithm and what Benjamin Edelman (2010) termed "hard coding." The general allegations were that Google triggered its Universals "too frequently" and placed them "too prominently" in its SERPs. We discuss the general allegations first and then turn to the specific allegations.

A. General Allegations

A fundamental problem in assessing the allegations that Google's triggering and placement of its Universals was biased in a general sense is ascertaining exactly what such allegations mean. The FTC had to consider what facts it would put forward to prove bias if it chose to bring a case. Had a case gone to court, the FTC would have had the burden of proof and Google would only have had to argue that the FTC had failed to meet the burden. At the investigational stage, however, the challenge for Google was to put forward evidence to disprove the bias allegations, recognizing that doing so meant proving a negative.

To determine what facts might be relevant, one immediate question is whether it was Google's intent that was relevant or, alternatively, whether it is possible to establish bias as a purely factual matter independent of Google's intent.

At a purely conceptual level, bias by Google toward its Universals would mean that it places its Universals above competing sites of higher quality. There is, however, no objective measure of the quality either of a Web site or a Universal result. To be sure, data that serve as general indicators of quality exist. For example, the FTC closing statement mentioned click data. It is intuitively plausible that high click rates on a site indicate that users find the site useful. If Google relies on click rates to guide its decisions about its algorithms and the design of its search pages, then click rates are relevant. But if

Google does not rely on click rates, then the FTC or some other complainant could not prove Google bias with click data. Moreover, while Google's reliance on click data makes them relevant, one needs to understand how Google uses them. If Google considers them to be merely suggestive and just one piece of evidence to consider, then antitrust authorities and courts should not view them as definitive.

Another approach one might consider to assessing bias is to use Google's own algorithms. That is, one might suggest that to "level the playing field" for Google's Universals and vertical search sites with similar themes, Google should score its Universals with the algorithm it uses to rank Web pages and use that score to trigger and place its Universals as if they were Web pages. Whatever intuitive appeal this argument might have, it makes no technical sense. Google's thematic results are dynamically generated content, not Web pages. Google does not crawl and index its own Universals and so cannot score their quality as it does third-party Web sites.

Even if one could measure quality objectively or score Google's Universals as if they were Web pages, using those approaches to measure bias would rest on the assumption that the relevant benchmark for unbiasedness is maximizing user welfare. For antitrust purposes, however, maximizing user welfare is not the relevant standard for unbiasedness. Because of its two-sided business model, Google might rationally make trade-offs in its search design between the interests of people who search on Google and advertisers without in any way deviating from competitive behavior. A good analogy is broadcast and basic cable television networks, which also have two-sided business models. Inserting advertisements into television programs makes the programs less attractive to viewers.[63] In addition, a television network might decline to broadcast a show that it knows viewers would like to watch but which advertisers do not want to sponsor. The decision to air a less popular show that will generate more valuable advertising may be biased relative to a viewer welfare standard, but it is not necessarily bias relative to competitive behavior that maximizes profits under competition.

While an objective assessment of Google's alleged bias is not possible, Google does have techniques for evaluating proposed changes to its algorithms and for assessing the on-going quality of its search results. Indeed, those techniques are fundamental to the way Google competes. To assess the bias claims against Google, one can reasonably ask whether the objective behind those processes is to

[63] Even if television users find some advertisements entertaining and informative, the market evidence is that viewers are willing to pay a premium for video entertainment without advertising.

maximize the quality of search for users and whether Google applied those processes in evaluating Universals. If the answer to both questions is, "Yes," implying that Google has developed its Universals to improve the quality of its search for users, then the bias allegations have to be dismissed. If the answer to one or both questions were, "No," the inquiry would not end. One would still have to investigate what objective other than improving search for users Google was pursuing. A finding that Google adopted changes that it believed lowered the quality of its search results to sell more advertising would not be sufficient to establish bias that would be relevant for antitrust purposes. The potential finding that might have suggested a competitive concern would have been that Google reduced search quality in order to drive rivals from the market (presumably by demoting high quality competitive sites).

That is not, however, what the FTC found. In its closing statement, the FTC said, "The totality of the evidence indicates that, in the main, Google adopted the design changes that the Commission investigated to improve the quality of its search results, and that any negative impact on actual or potential competitors was incidental to that purpose."[64] While one might wonder what basis the FTC had for the qualification implicit in the clause, "in the main," this finding was (properly in our view) sufficient to dismiss the allegations of general bias.

To be sure, a careful reading of the FTC's closing statement leaves unclear whether the FTC concluded that Google believed it was designing Universals to benefit users or whether the FTC independently formed its own assessment. The distinction is important because if the FTC believes that it could assess bias on its own, then presumably it might have brought a case had it found Google's results to be biased based on what it concluded was the right way to measure bias. As a matter of competition policy, we question whether the FTC, any antitrust agency, or any court is competent to determine search quality independently. Finding better ways to measure search quality and basing design decisions on those measures (as well as judgment about the appropriate use of inherently imperfect measures) is an essential part of search engine competition. Independent assessments of search quality by an antitrust agency would come perilously close to regulating search rather than relying on competition to improve it.

[64] FTC Closing Statement, Note 2, *supra*.

B. Specific Allegations

Some Web site publishers have alleged that Google sometimes explicitly demotes specific Web sites or classes of Web sites. The FTC's statement strongly indicates that it rejected this charge.[65] But even assuming for the sake of argument that Google does so, such behavior is not necessarily bias. Because search algorithms are inherently imperfect, Google might judge that some sites that score well (perhaps because their designers "game" the algorithm) are poor quality sites. One possible solution is for Google to identify the features of its algorithms that are subject to such manipulation and modify them in a general way. As a practical matter, however, it might simply demote offending sites. As long as it demotes sites that it views as being low quality, it is not engaging in bias even relative to a searcher welfare standard.

As we discussed in Sections IV and V above, demoting sites for reasons other than quality would be bias relative to a searcher utility standard. If the rationale for the demotion is to sell more sponsored links (perhaps by inducing the sponsored sites to buy sponsored links), then the behavior is not bias relative to a standard of (non-exclusionary) profit-maximization. The one rationale for demotion that might raise antitrust concerns would be if Google were demoting the sites because it viewed them as competitive threats.

The other specific allegation of bias concerned "hard coding." For example, Google used to have health content. If one queried for the name of a disease or medical condition, the first listing would be information from Google Health. Edelman compared Google search results from correctly typing the name of a medical condition with those from appending a comma to the query. At that time, the addition of the comma prevented the algorithm from triggering a result from Google Health. Edelman (2010) interpreted this as evidence of Google bias for its own content.

Google discontinued Google Health (and eliminated the effect of commas on search results), but there are current examples in which the syntax of a query affects whether the SERP includes a Universal. An example is that when we queried Google for "FTC v. Staples," the top link Google returned was "Court

[65] "The totality of the evidence indicates that, in the main, Google adopted the design changes that the Commission investigated to improve the quality of its search results, and that any negative impact on actual or potential competitors was incidental to that purpose. "

Opinions for FTC v. Staples." Clicking on the link takes the searcher to Google Scholar and a link to the district court opinion. Querying Google for "FTC vs. Staples" did not yield the same result. Thus, it appears that the triggering of Google Scholar for court decisions rests on the specific syntax of the query. But that is not bias. If Google's designers judged (with the aid of whatever evidence they use) that the most useful response to "FTC v. Staples" is a link to the court decisions, then placing that link is not a bias. Initially, Google's response to queries was restricted to links to web sites generated by applying an algorithm to the results of crawled Web sites. Google Calculator, Google Flights, and Google Health all represent qualitatively different responses. Moreover, these responses reflect classes of searches for which Google has decided it can provide users with a better response than is available from a Web search. If Google is going to have some responses generated through Web search and others generated in other ways, it has to have a meta-algorithm for deciding which type of result to place where. The fact that the placement of different types of responses rests on the precise syntax of a query may be necessary. And while one might debate whether Google Flights is more convenient for users than Travelocity or Orbitz, application of a search algorithm to them cannot resolve the issue.

VI. Conclusions

The allegations that Google's search results were "biased" towards its Universals were framed to suggest that Google was seeking to "leverage" its "dominance" in the "general search market" into adjacent markets for thematic search. Economic analysis reveals this framing to make no sense. Instead, the issue in the case was whether Google's development of a new generation of search based on improved technology – in particular, the blending of the results of multiple search algorithms – was anticompetitive. Put another way, a suit by the FTC against Google would have entailed labeling improvements in Google search as anticompetitive. The harm that such a suit could have done is even more clear when one considers that Google built on the innovations underlying the Universals at issue in the investigation to further improve the quality of its search. When Google competes to develop content to answer queries, should it have an affirmative requirement to demonstrate to the satisfaction of regulators and/or a court that any of its own content that Google chooses to display is superior to the

alternatives? Such a requirement would surely dull Google's incentives to continue to innovate, would invite competitors to complain about improvements to Google search, and would constitute a reliance on regulation rather than competition to ensure search quality.

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